CANADIAN GEOGRAPHICAL JOURNAL

Vol. XLIV No. 2 • FEBRUARY 1952 • PRICE 35c

THE CANADIAN GEOGRAPHICAL SOCIETY

OTTAWA, CANADA

The Society's ambition is to make itself a real force in advancing geographical knowledge, and in disseminating information on the geography, resources and people of Canada: In short, its aim is to make Canada better known to Canadians and to the rest of the world.

As one of its major activities in carrying out its purpose, the Society publishes a monthly magazine, the Canadian Geographical Journal, which is devoted to every phase of geography—historical, physical and economic—of Canada, of the British Commonwealth and of the other parts of the world in which Canada has special interest. It is the intention to publish articles in this magazine that will be popular in character, easily read, well illustrated and educational to the young, as well as informative to the adult.

The Canadian Geographical Journal will be sent to each member of the Society in good standing. Membership in the Society is open to any one interested in geographical matters. The annual fee for membership is four dollars (Canadian currency).

The Society has no political or other sectional associations, and is responsible only to its members. All money received is used in producing the Canadian Geographical Journal and in carrying on such other activities for the advancement of geographical knowledge as funds of the Society may permit.

CANADIAN GEOGRAPHICAL JOURNAL

Published monthly by
THE CANADIAN GEOGRAPHICAL SOCIETY
36 Elgin Street, Ottawa

Editor - GORDON M. DALLYN — Assistant Editor - MALVINA BOLUS

This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustrations, of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth and other parts of the world in which Canada has special interest.

The articles in this Journal are indexed in the *Canadian Index* which may be found in any public library.

The British standard of spelling is adopted substantially as used by the Dominion Government and taught in most Canadian schools, the precise authority being the Oxford Dictionary as edited in 1936.

Address all communications regarding change of address, non-delivery of Journal, etc., to the publication office, 1,000 St. Antoine St., Montreal, Canada, giving old and new address. On all new memberships, the expiry date will be printed on wrapper containing starting number. This will constitute a receipt for subscription.

Membership dues of The Canadian Geographical Society, which include postpaid delivery of the Journal, are $4.00 per year in any country, payable at par in Ottawa.

Member Audit Bureau of Circulations

SPECIAL REPRESENTATIVES:
Ontario and Quebec: F. A. DALLYN

Toronto office — 21 King Street, E. (Tel. EMpire 4-2863)

Montreal office — 1,000 St. Antoine Street, (Tel. UN. 6-5285)

Western Canada: — Major J. W. B. GREEN, 506-12th Street "C" North Lethbridge, Alberta.

Europe: S/L W. H. CORKILL, M. B. E. The Mead, West Dumpton Lane, Ramsgate, Kent, England.

CONTENTS

FEBRUARY, 1952 ✦ VOLUME XLIV ✦ NUMBER 2

COVER SUBJECT:—*Winter at Mount Revelstoke National Park, B.C.*

✦

AUTHORIZED AS SECOND CLASS MAIL, POST OFFICE DEPARTMENT, OTTAWA

PRINTED IN CANADA

Water for the Prairies

by GEORGE SPENCE

Spillway of St. Mary River dam, Alberta, at the official opening on July 16, 1951. G. M. Dallyn

"IT GIVES me great pleasure to turn the waters, from the first nationally-constructed large reservoir, upon the fertile lands of southern Alberta. I consider the inauguration of this policy as the outstanding and most helpful achievement of my period as Minister of Agriculture for Canada over fifteen years. I trust it is only the beginning of a development which will multiply Canadian homes in the West."

With these words the Right Honourable James G. Gardiner pulled down a lever in the control tower of the irrigation outlet works which released water from the reservoir into the main canal and sent it on its way to water the dry lands of the area.

The occasion was the official ceremonies conducted on July 16, 1951, which put into operation a big dam and irrigation reservoir on the St. Mary River near Spring Coulee, Alberta.

St. Mary dam, looking downstream, in May 1951. Shown are the completed main fill, the nearly completed spillway section, and the approximate locations for the diversion and irrigation tunnel inlets, partly covered with water.

The celebration, witnessed by some 10,000 people, pointed up the first stage in the construction and operation of the St. Mary and Milk Rivers Development, designed to supplement water supplies to existing irrigation districts and when completed to bring water to an additional 390,000 acres of dry land in the area, or a grand total of over half a million acres.

The Palliser Triangle

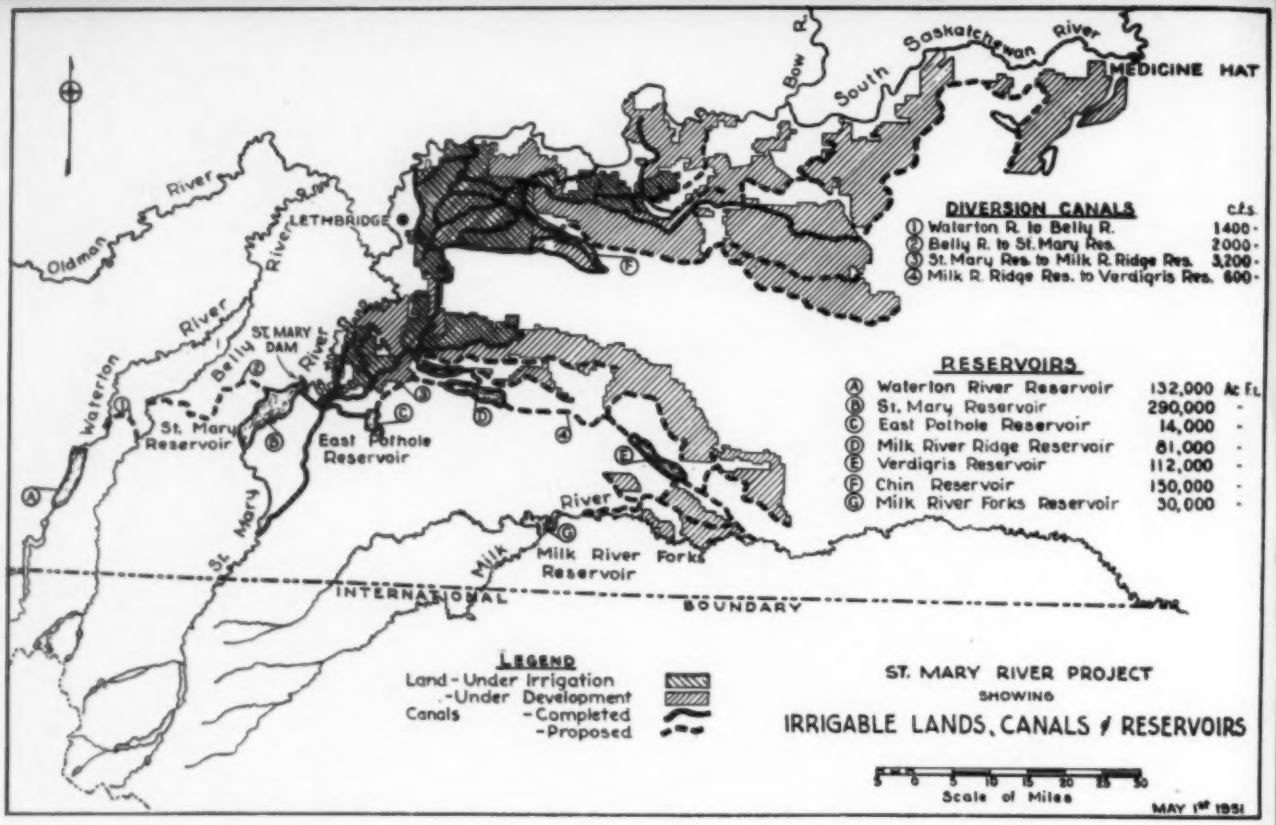
The first definition of the so-called "drought area" is contained in a report written ninety-odd years ago.

In the year 1857, Captain John Palliser, an officer of the Royal Engineers, was commissioned by the British Government to head a scientific expedition to, and directed to explore, "that portion of British North America which lies between the northern branch of the River Saskatchewan and the frontier of the United States and between the Red River and the Rocky Mountains". He was further directed to explore and examine, among other things, "the nature of its soil, its capability for Agriculture".

In his report, printed in 1862, Palliser describes the open plains section of Central North America in the following words: "This central desert extends, however, but a short way into British Territory, forming a triangle having as its base the 49th parallel from longitude 100 to 114 west, with its apex reaching to the 52nd parallel of latitude", an area of approximately 50,000,000 acres.

Palliser had no man-made records to guide him when he delineated the drought area but, being a scientist as well as an explorer, he read the warning that nature had indelibly stamped on the face of the country, over the centuries, for all to see. The great treeless plain, the short grass covering, the light brown soil low in organic matter were all infallible signs of a country deficient in rainfall. The Prairie Farm Rehabilitation Administration area includes the light brown and also the dark brown soil zones and comprises an area of 104,463,360 acres. Experience over the years has shown that this is roughly the boundary of the area which

Aqueduct near Brocks, Alberta, built in 1920 to carry water three miles. It is so large that it could carry sizable boats.



presents the greatest hazards to cereal crop production because of low and irregular rainfall.

These particular climatic conditions have forced upon the country over the period of settlement a system of agriculture peculiar to the area. This system can be broadly classified in two divisions: (1) ranching, and (2) dry-land farming.

Ranching

On the non-arable lands in the more severe drought areas of the southwest, large sections of the country are given over almost exclusively to ranching, where the economy of the "water-hole" and the grazing lease prevails. Here the only cultivated crops are feed crops grown, for the most part, on irrigated lands. The rancher was the first irrigator.

A small-scale stock-watering reservoir built in a P.F.R.A. community pasture where previously there had been serious shortage.

A stock-watering dugout in a community past Saskat windmill to pump water from the dugout (whi fenced

The production of meat is the rancher's business. Given a suitable location which provides an adequate water supply, together with low-cost grazing, the rancher goes all out in using mass methods to convert the nutritious native grasses into pounds of beef, mutton and lamb for the tables of the world.

A ranch economy is sound in the sense that the industry can be carried on indefinitely, for with proper range management there is no impairment of the soil's productive capacity. It is a well recognized fact, however, that ranching, by itself, can never build up a country. The population of a ranching area is too sparse to provide all the services and amenities that go to make up modern living. Moreover, the returns, on an acre basis, from lands used exclusively for grazing are very low compared with the returns from cultivated lands.

While the steer that comes off the ranges in southwest Saskatchewan and southern Alberta is considered one of the best, if not *the* best "grass-fed" steer produced anywhere, it is nevertheless a fact that the great bulk of range-bred cattle and sheep go on the markets, every fall, in an unfinished condition.

This represents a great loss to the agricultural economy of the country. Obviously, the community would be benefited and the economy strengthened to the degree that this annual loss could be reduced, or eliminated, by a policy of feeding and fattening on the ranch, farm, or feed-lot as the case might be. Irrigation makes such a policy possible. In the Lethbridge area, where large-scale irrigation is practised, the feeding and fattening of livestock has reached the proportions of a major industry. Over 75,000 head of cattle and 60,000 lambs are being fattened in the feed-lots in the 1951 season.

Irrigation ensures maximum returns to the rancher from his grassland acres in pounds of meat (and therefore dollars) while affording, at the same time, a ready cash market for the farmer's hay and grain crops, thus saving him freight and shipping charges which he would otherwise have to pay.

Dry-land Farming

Cereal crop production in the drought area is a continuous battle to conserve the precious soil moisture. Consequently, dry-land farming depends, for success, on tillage and cropping practices designed to conserve all the available precipitation and store it in the soil from one crop year to the next. This practice is known as "summerfallow". Summerfallowing from one-third to one-half the cultivated acreage is now the accepted basis of dry-land farming on the prairies.

Saskatchewan. Power is derived from the fenced to prevent pollution) into troughs.

Sheep raising, not extensively practised, is quite desirable on the short grass prairies so long as there is no over-grazing.

A farm lay-out on the Regina plains. The dugout is built near the house, inside the pasture area. Water is used for stock and for home, after inexpensive filtration.

Mr. A. E. Palmer, Superintendent of the Experimental Station at Lethbridge, is authority for the statement that in 1950 there were 20,000,000 acres of summer-fallow in the three Prairie Provinces. This is an enormous amount of land to take out of crop annually. Then, too, this system of farming has some other notable defects; for one thing, it does not entirely ensure against recurrent crop failure from drought. This is because the high plains are not only subject to low and variable rainfall, but are also subject to periodic drought cycles when there are several dry years in succession. This happened in the thirties. No cropping or cultural practices can conserve moisture when there is no moisture to conserve.

Another bad feature of repeatedly exposing the bare surface of the soil to the elements of sun and wind is that the practice is destructive of the precious organic matter, so very limited in all prairie soils. Intensive cultivation, or bare fallow, will also, in time, break down the granular texture of the soil creating a condition favourable to soil drifting. True, in recent years the "bare fallow" practice has been modified so as to render it less harmful, but the bad effects inherent in the practice have not as yet been entirely eliminated.

Perhaps, the most unsound features of present cropping and tillage practices, now so general, is that they have led to a "*one* crop" system of farming. As wheat can withstand severe droughts better than other

Rubber boots and long handled shovel mark the irrigation farmer. This is the gravity ditch system, with water impounded behind a portable canvas dam.

grains and also because it commands a ready cash market, wheat has become the dominant crop in the low rainfall area.

While it is right to say that this wheat economy has built up the Prairie Provinces, as we have the happiness to know them today, it is also true that a one crop system is a narrow economy compared with a more balanced agriculture, combining cereal crops and the production of livestock as one enterprise—or mixed farming.

To understand a problem is the first step to its solution. The recent trend in agriculture on the open plains is not in the direction of more diversification; rather it is in the opposite direction. The reason is easily understood. Dry-land farming tends to larger and larger farm units employing mass methods in the production of the bread grains. Farm mechanization has accelerated this trend. Then when grain prices are high the farmers become "wheat minded" and every available acre is given over to wheat production.

The basis of livestock raising is grass—more and better pastures. Under conditions common to the open plains area it takes from 25 to 40 acres of native grassland to pasture one head of cattle for the season. The great majority of farmers do not have access to low cost grazing which native grasslands provide. Consequently, to keep cattle, they have to pasture their deeded lands on which they must pay taxes in the higher brackets. They cannot afford to put such land down to grass.

Conservation

Any program designed for the conservation and orderly development of our soil and water resources, to achieve a more stable and balanced agriculture, is good business and sound public policy. To this end there is co-operation between the appropriate departments of the federal and provincial governments, together with the active assistance of the three provincial universities. The work is on a practical as well as on a scientific level.

Leadership and co-ordination are given by the Prairie Farm Rehabilitation Administration, an agency of the Federal Department of Agriculture. The activities of this organization embrace a comprehensive program of water conservation and development in conjunction with land utilization and rehabilitation.

It can be said with assurance that continued support and development of the projects undertaken by the several agencies in this area will eventually result in the elimination of many hazards incidental to farming in the dry-belt, and will bring greater economic stability to prairie agriculture.

Progress under the Prairie Farm Rehabilitation Act

This act, passed in 1935, provides author-

Here a small portable sprinkler system has been installed to supply the water requirements of a farm garden from the dugout which also provides the home water supply.

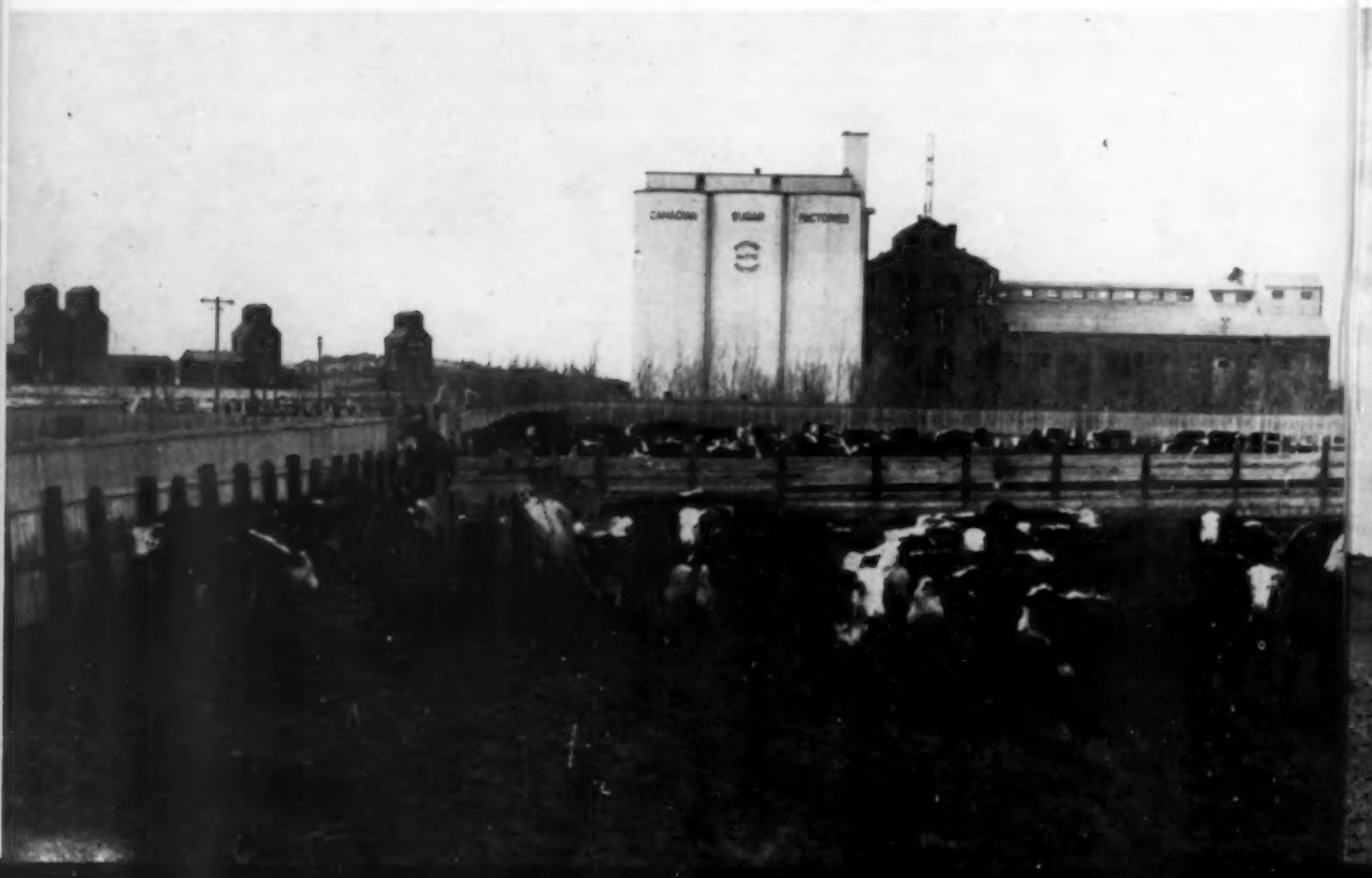
ity for financial assistance from the federal government for the conservation and development of the water resources within the P.F.R.A. area. Benefit payments are made on a self-help principle for the construction of "individual projects", small dams, and dugouts used for stock-watering and irrigation. Payments are also made on "community projects" on the same principle and for the same purpose. Under this policy 46,000 small and community projects had been constructed up to January 31, 1951.

In addition to these small projects, 224 medium sized projects have also been constructed of which the largest is the Swift Current-Herbert project in Saskatchewan with a total of 20,000 irrigable acres. Six other sizable projects, all in Saskatchewan, can be mentioned as being in the same category: Val Marie, Eastend, Consul, Maple Creek, Valley Park and Frenchman Flats. In the same grouping, too, there are six projects in Alberta: Aetna, Berry Creek, South Macleod, Eureka, Sounding Creek and Dead Fish Creek, which together make a total of over 100,000 acres under the ditch. In the two provinces there is now a total of 875,000 acres of irrigable land.

The development of large-scale irrigation projects is conditional upon mutually satisfactory agreements being reached between the federal government and the respective province or provinces concerned. The federal contribution under this policy is a non-recoverable amount. The principle is now generally accepted that benefits accrue to the country as a whole from the development of its land and water resources; therefore, the water-users situated in these large projects should not be saddled with all the capital costs connected with their development.

The St. Mary-Milk Rivers project, already mentioned, is a case in point. Here the federal government has undertaken the construction of the main reservoirs, namely, the St. Mary, Jensen, Ridge and Waterton, together with connecting canals, the costs of which are not reimbursable to the federal treasury. The provincial government, for

Alfalfa, grain, and sugar pulp are used in finishing cattle for market, hence the proximity of these feed lots to elevators and sugar factory at Picture Butte, Alberta.



On the Val Marie irrigation project in southwestern Saskatchewan, built by the P.F.R.A. in 1935, the main production is forage crops for livestock in the area.

The trend in agriculture is towards increased mechanization. Here a hydraulic stacker attachment to the farm tractor simplifies and hastens haying operations.

Reclaimed land painstakingly being brought back to productivity. In 1937 this area, six miles east of Cadillac, Saskatchewan, was blown out and resembled a desert.

its part, will construct the secondary reservoirs and distribution system. It is optional with the province whether it recovers all, or any part, of its outlay from the water-users.

Beets are among the leading products on well established irrigation projects.

Figures obtained from P.F.R.A. records as of January 31, 1951, show that approximately $36,000,000 has been spent on these projects since the initiation of the program. This figure includes surveys, administration and other costs connected therewith.

Allied Industries

The benefits of irrigation are reflected indirectly by the growth of secondary industries in locations where large-scale irrigation is practised. The Lethbridge district is a good example of this development. There are three sugar factories now established in that area, located at Raymond, Picture Butte and Taber. These factories have a total capacity of over half a million tons of beets annually—enough to yield 150,000,000 pounds of sugar. Figures compiled as of February, 1950, give a total production of 123,802,300 pounds of sugar which together with the by-products, molasses and pulp,

Not many years ago this land, near Brooks, Alberta, was bare and parched. The trees and the prosperous home are a tribute to the energy of the people and the boon of irrigation.

have a value of $13,775,000. These factories give employment to over one thousand people of whom over two hundred are employed full-time. The pulp and molasses is used to good advantage in stock-fattening operations.

In addition to the sugar factories there are three vegetable canning factories. These are located at Lethbridge, Taber and Magrath and they process corn, peas, beans, carrots, soup mix, pumpkins and table beets. The gross market value of the processed vegetables ranges from $3,000,000 to $5,000,000 yearly. The industry gives full-time employment to about one hundred men and women, while eleven hundred are employed part-time. The yearly payroll is about $300,000.

Other industries are engaged in the manufacture and distribution of special equipment, land levellers, sugar beet harvesting machines, sprinkler systems and the like. Also, numerous service industries and businesses grow up and prosper under the conditions of close settlement and general prosperity characteristic of highly developed irrigation systems.

In short, where large-scale irrigation is practised in an area, conditions have been created which support more people and provide them with more business and professional opportunities, thereby contributing to the general welfare of the country; which provides the best economic justification for the full conservation and the orderly and expeditious development of our water resources. It has been estimated that altogether a total of approximately 3,000,000 acres of prairie lands can be irrigated from available water supplies. The possibilities are, therefore, immense and offer a stirring challenge to statesmanship and enterprise—water is "liquid gold" on the dry prairies.

ABC Islands of the Netherlands West Indies

Story and Photographs by RICHARD HARRINGTON

FROM Venezuela's rich Lake Maracaibo region, shallow-drafted oil tankers carry crude oil to refineries on the nearby islands of Aruba and Curaçao. From there the black gold of the oilfields flows northward to Portland and Halifax, southward along the east coast of South America, and eastward across the Atlantic.

Three little Dutch islands—Aruba, Bonaire and Curaçao— lie only a few miles off the coast of Venezuela. Together with three tiny dots 600 miles across the Caribbean (Saba, St. Eustatius and half of St. Martin) they comprise the Netherlands West Indies.

Totalling 355 square miles in all, the ABC group has achieved present-day prosperity through the Venezuelan oilfields. Aruba and Curaçao, with their large "cracking" plants, are closest to the oil wells of Lake Maracaibo. Bonaire remains peaceful and rural, but many of its inhabitants have also gained through employment in the refineries. All three islands were guarded by local and allied forces during the war years.

The population of the islands is made up of various West Indies blood-lines: Negroes and Creoles, Chinese, East Indians, Dutch and Americans—indeed between forty and fifty different nationalities. The official language of the islands is Dutch, but English and Spanish are spoken fluently. A speech peculiar to the islands is *papiamento*, a verbless, grammarless mixture of Spanish, Portuguese, Yiddish, English, Dutch, African and Indian. In Aruba the proportion of Indian words in *papiamento* is high, but it is still higher in Bonaire.

The three islands lie close together, enjoying the same trade winds blowing gently upon them, the same freedom from hurricanes, the same short rainy season. They are flattish, on the whole, with the occasional hill thrust up suddenly. Curaçao, lying between Aruba and Bonaire, is the largest and was first to be discovered—in 1499, by Spaniards under Alonzo de Ojeda. Amerigo Vespucci recorded the landing, and named the island "Isle of Giants", for the explorers found there tall women and men of such stature as to cause an abrupt change of plans, and they were happy to leave unscathed. The Spaniards did not attempt settlement until 1527, and that meant little more than setting out cattle to run wild in order to provide food. Hawkins in 1565 described Curaçao as "one great cattle ranch", and thus it remained for about a century. The descriptions of the old explorers, however, were sometimes far from accurate.

Narrow houses with curved red tiles (much like those in Holland) line the waterfront of Willemstad, Curaçao — seat of government for the Netherlands West Indies.

Above:—Willemstad's pontoon bridge, connecting the Punda with Otrabanda, swings open to allow ships to pass by.

Below:—In a dock slip called the Waaigat schooners from the nearby islands form a floating market for the citizens of Willemstad.

The Dutch dispossessed the Spanish without difficulty in 1634, and added the three islands to the territory of the Dutch West Indies Company, which also had large holdings on the mainland. In a century of relative peace, the excellent harbour of Willemstad became the trans-shipment point for great quantities of sugar, indigo, cacao and tobacco.

The narrow channel of St. Anna Bay reaches inland to the sprawling basin of Schottegat, large enough for a fleet. The entrance was guarded on the west by the Rif Fort, on the east by Fort Amsterdam and Water Fort. Thanks to such precautions, Curaçao was not harried by privateers and buccaneers as were other islands of the Caribbean.

Nevertheless, the islands fell to the British in the Napoleonic campaign, but were returned to Holland after the Peace of Paris, 1815. The plantations which had made Curaçao so valuable had, however, deteriorated. So had its commerce. The abolition of slavery was the final blow which ruined the sugar-cane plantations.

Willemstad (seat of the government for the Netherlands West Indies) was made a free port in 1828. Although this aided commercial trade, Curaçao still seemed to many Dutchmen a "losing colonial venture". Another effort was made when the Panama Canal was built. Willemstad dredged its harbour, built new docks and installed coal-bunkering facilities. But Colón, with its more central location, proved more valuable to shipping. Large deposits of calcium phosphate at Table Hill became a valuable resource. Over 100,000 tons are exported annually to Holland and the United States to be manufactured into commercial fertilizer.

It was oil which changed the life and outlook of Curaçao, as well as of its neighbour, Aruba. The Curaçao Petroleum Industry Company (C.P.I.M.—a subsidiary of Royal Dutch Shell) set up a refinery on the excellent harbour at Willemstad. Work began in 1915, and construction has continued until now C.P.I.M. is one of the world's most important refineries. Thanks to oil, the population of Curaçao has almost tripled within the last thirty years, to reach the present total of 102,000 inhabitants.

The island has excellent air connections, but most tourists arrive by steamship. At first sight, Curaçao seems dry and colour-

less, though set in a blue-green tropical sea. But as one rounds the reefs into St. Anna Bay, the city of Willemstad bursts upon the sight like a flamboyant garden of colours. The houses are painted in soft bright tones —anything but white, for by an old by-law whitewash is forbidden as too dazzling. Whether blue, green, yellow, ochre or pink, the narrow, gabled buildings are almost all roofed with curved red tiles.

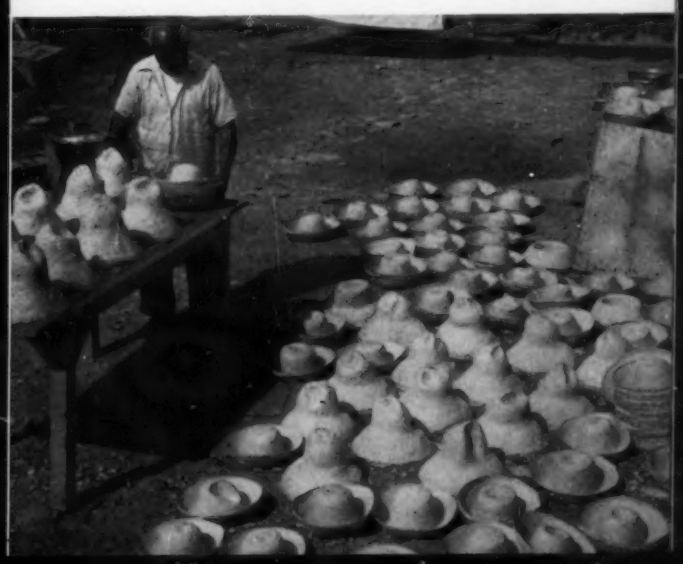
Because of the trade winds, there is little odour of oil fumes in the air, though the water of the Schottegat glistens with a film of rainbow hues. As the ship sails through the narrow channel between business houses, passengers can look into second-floor office windows easily. It is, as one observer noted, "like riding downtown on top of a double-decker bus".

As the ship steams slowly up the channel, the famous Queen Emma pontoon bridge swings open. The bridge was first built in 1888 by a private company. Tolls were charged according to the prosperity of the user. Pedestrians wearing shoes paid a toll of two cents; those in sandals, one cent; poor folks who had no shoes of any kind went free. Tourists used to take innocent pleasure in removing their shoes and padding across barefoot. But the new government bridge is free to all comers.

The pontoon bridge connects the old section of the city—the Punda—with the newer Otrabanda ("Other Side"). The bridge is swung open for all ships by mechanism concealed in the end pontoon, which is actually a small boat. Automobile traffic is thereby occasionally halted for an hour at a time, since Willemstad is one of the busiest ports in the Caribbean, some 10,000 ships, tankers

Above:—There is no race prejudice in Curaçao, so this Creole girl claims.

Left and below:—Straw hats are hand-woven by many of Willemstad's Creoles — and sold in the open market.



and schooners having harboured there in 1950. Motorists must wait, or make a ten-mile loop around the Schottegat. Free ferries shuttle back and forth carrying pedestrians.

Facing on St. Anna Bay are the city's main streets, along with Breedestraat, which runs through both sides of town. Willemstad is actually a tripartite city, excluding suburbs. The Punda was settled in its earliest years, and here streets are narrow, for the buildings clustered close to the protection of the forts. Balconies, supported by pillars, were built out over the streets; then gradually the pillars were enclosed, so that the streets became much narrower. Along some of them the sidewalks are only a foot wide, and are known locally as "lizard sidewalks".

A slit of water, the Waaigat, cuts off Punda and its suburb, Pietermaai, from the residential subdivision of Scharloo, with its charming homes of Dutch and French architecture. The Waaigat is also the schooner basin, and here the sailing vessels line up along the wharf to form a floating vegetable, fruit and fish market. Vessels from Venezuela and neighbouring islands regularly bring their wares to market here.

Shopping in Curaçao can be an adventure, for the stores of Punda are filled with merchandise from all over the world, most of which enters the country with only three per cent duty. East Indian shops carry fine silks and filigree jewellery, fancy leather-work, ivory and wood carvings. French perfumes, Madeira embroidery, cameras, pottery and blue Delft, lace and lingerie are to be found at low prices. American goods are everywhere advertised. Wines and liqueurs are abundant. One tiny clean factory makes Curaçao liqueurs from the old island recipe, distilling the essence from the wrinkled bitter peel of local oranges into the famous cordial.

Columbus Street leads past the Mikve Israel synagogue; built in 1732, it is the oldest synagogue in the Western Hemisphere. Portuguese Jews who sailed to Curaçao in the seventeenth century became landowners under terms which were unusually liberal for those days. They soon established themselves, and their descendants are still leading business men and bankers in Curaçao. Just outside the city is their ancient cemetery, its flat headstones elaborately carved with scenes from the Scriptures.

Many beaches make the island of Curaçao a delight. East of Willemstad are those of Spanish Bay. To the west is the Piscadera Bay, with ornate club buildings and beach, owned by C.P.I.M., but open to the public. At the southwest of the island is Knip Bay, with its curving beach. Old "land-houses" at Daniel and beyond St. Kruis represent some of the earliest plantation architecture. A coral cavern at Boca Tabla on the northwest corner of the island, and a grotto near Hato Airport are also of interest.

In the busy shopping centre of Willemstad some of the older streets are barely fifteen feet wide — making one-way traffic not only advisable but, as is apparent here, quite unavoidable.

Above:—Small houses, with walls of various pastel shades, form a series of steps alongside this hilly Willemstad street.

Left:—A modern public school in Willemstad. In the foreground, at left, is a statue of Peter Stuyvesant, with one wooden leg; he was Governor of New Netherlands at the time when Manhattan was a Dutch possession.

In Willemstad's streets and parking lots many modern American cars are in evidence. Traffic is directed by a policeman (at left) on a concrete pedestal, protected from the tropical sun by a large 'umbrella'.

Just outside Willemstad is an ancient Jewish cemetery, its marble headstones dating back to 1652; on many of them are carved biblical scenes, such as the famous judgment of Solomon, here shown.

Hato Airport, on the north side of the island about eight miles from Willemstad, offers every convenience to the traveller. Royal Dutch and Pan-American Airlines maintain flight connections with other Caribbean islands, with North and South America, and direct to Europe. Half an hour's flying takes one to the island of Bonaire to the east —slightly more to the Dakota Airport of Aruba to the west.

Oranjestad, the capital of Aruba, is a mixture of the old and the new, with its Dutch colonial buildings, modernistic churches, and up-to-date shops. Nearby stands old Fort Zoutman tower, which has now become a

The floating market at Oranjestad, Aruba, displays goods from other islands and from nearby Venezuela. At the right is seen a uniformed customs officer, whose duty it is to keep a sharp eye on proceedings.

lighthouse. Within the past few years, Oranjestad has greatly increased the value of its sheltered harbour by deepening it and constructing nearly a mile of concrete docks. At the schooner wharf, boats from Venezuela sell fish (red snapper and barracuda among them), small bananas, coconuts and other agricultural products.

Aruba, with its 55,000 inhabitants, is the smallest of the ABC group, being only sixty-nine square miles in area. Until the oil interests chose the island as a site for storage tanks, and later refineries, Aruba was of little political or commercial importance and had a small, poor population; but since 1924 it has drawn immigrants from around the Caribbean and the population has quadrupled.

The oil port of St. Nicholas lies at the east end of the island, a conglomeration of tanks and piers and machine shops. Neat rows of homes are laid out to house the executives, the engineering staff, the office staff and workmen—strictly according to position. Some 7,500 men are employed at Lago, and unemployment is unknown. Storage tanks were set up on shore at first, and the Lago Transportation Company of Canada was organized to transport the oil. Then the coral reef protecting the shore was blasted, the harbour dredged, and an immense refinery was set up—now second largest in the world. Since Aruba lies only eighteen miles from the Venezuelan shore, this refinery is constantly busy. Two oil companies are represented: Standard Oil (by its subsidiary, Lago Oil Company), and Dutch Royal Shell, which in 1927 built large storage facilities and a small refinery at Arend, a few miles west of Oranjestad.

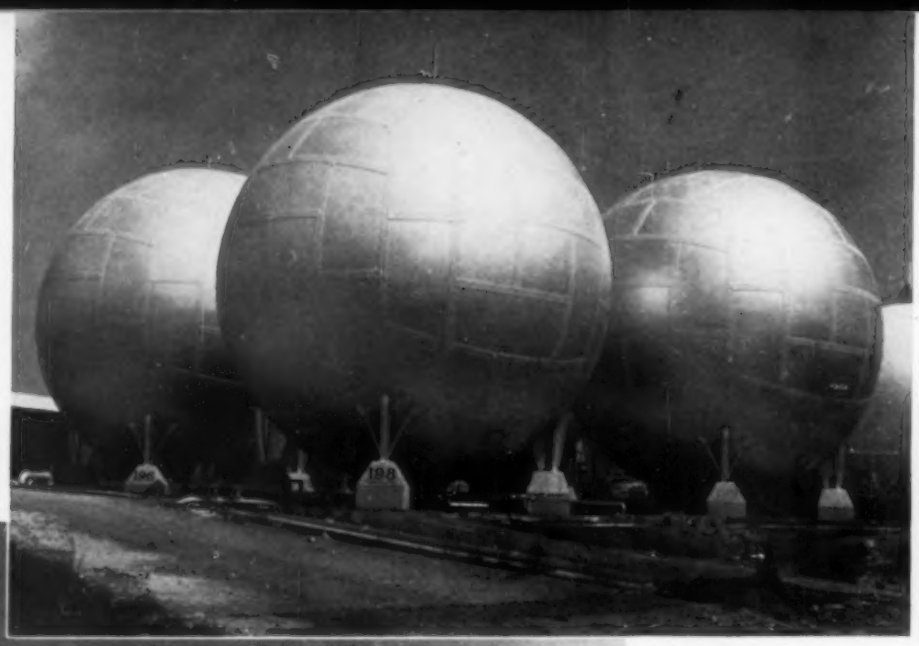
Although oil is the life-blood of the island, it is less interesting to the visitor than Aruba's natural beauties. Miles of improved road lead out from the capital to the white sand beaches of the north and west, to old gold workings, to coconut plantations. Picturesque little houses squat behind cactus hedges. Dark goats, skinny sheep, long-snouted pigs forage beside the roads. Lizards flash across in front of a car, and parakeets dart overhead.

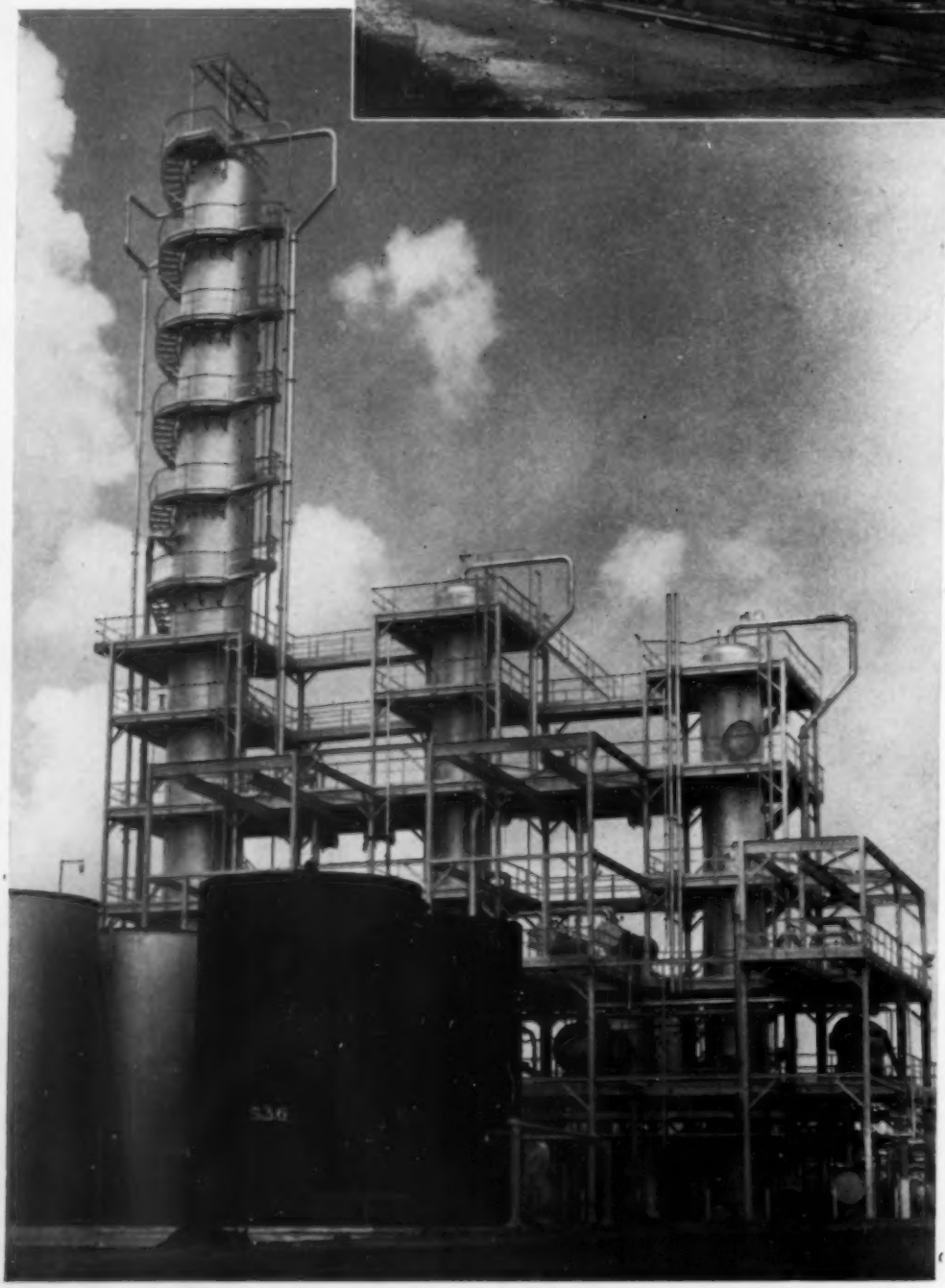
Right:—Aruba's only 'lake' is surrounded by strangely contorted dividivi trees.

Above:—The owner of this house used to cultivate his garden; now he works at the Lago oil refinery, and predatory cacti are rapidly taking over during his absence.

Above:—Aruba's sandy soil encourages the weed-like growth of many kinds of cacti. One species shoots up high enough to form an effective hedge along the roadways.

Oil from Venezuela is the life-blood of Aruba, which boasts two refineries. The major one at Lago, employing some 7,500 men, is the second largest in the world.

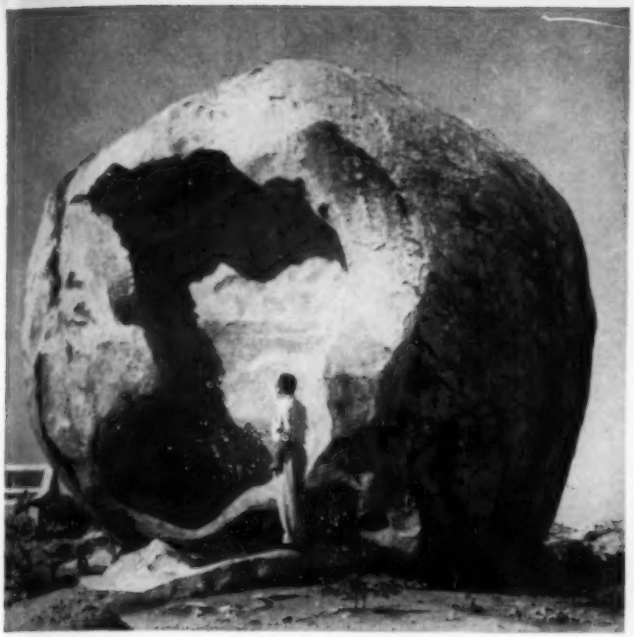




The giant aluminum-painted spheres (above) at the Lago oil refinery are high-pressure liquid storage tanks. A striking contrast in geometrical design is provided (left) by the rigid parallels of the refinery's 'cat-cracker', or catalytic cracking plant.

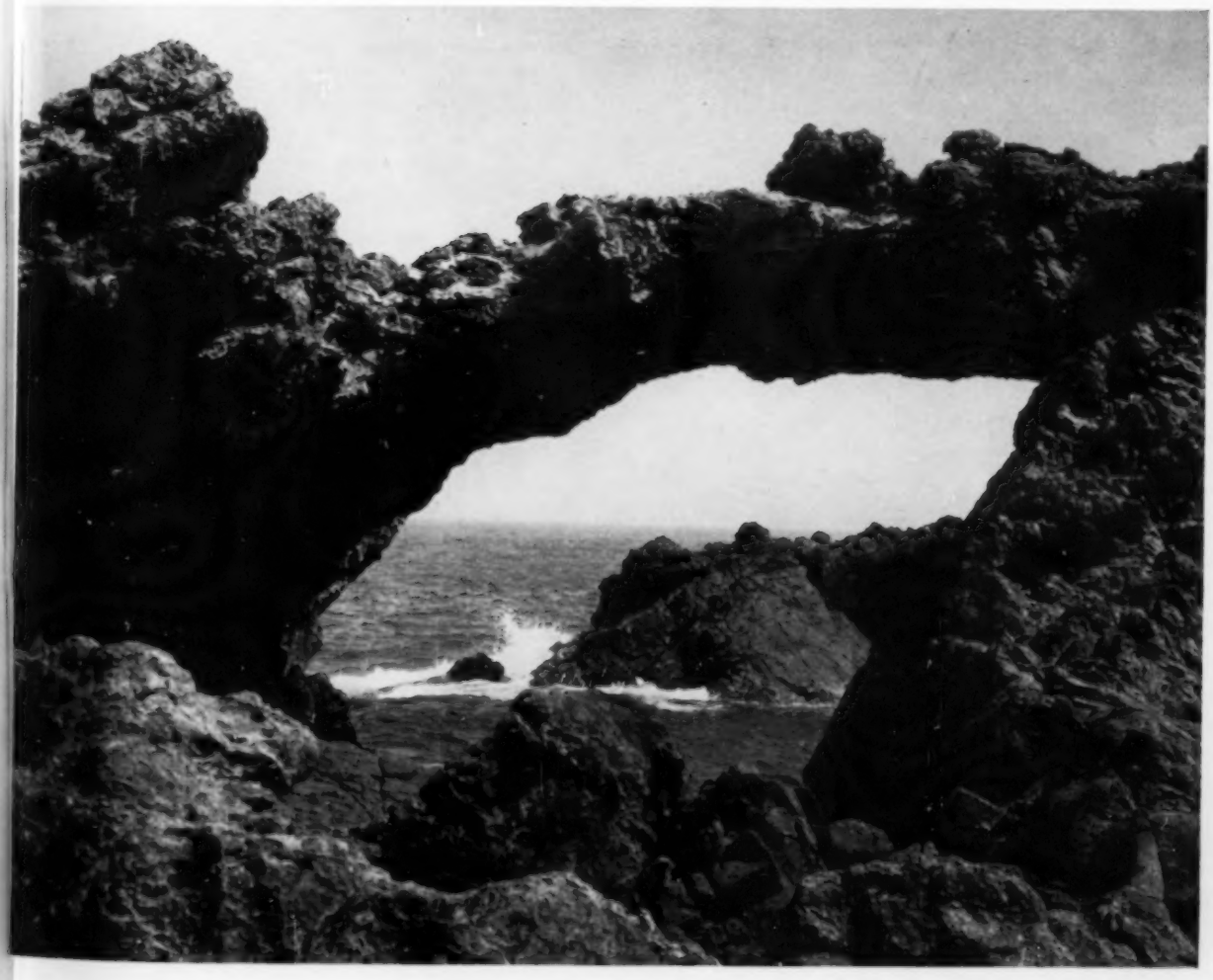
Right, top:— Long before man constructed his great metallic spheres on Aruba, nature had thoughtfully provided a pattern! Huge monoliths of diorite are scattered across the island, this particular example being located at Piedra Piat.

Right:—The ceaseless motion of the surf has carved many strange formations into the limestone of Aruba's north shore. Two natural bridges have been so created, including the one (here shown) at East Point.



Near Boca Prins and the beaches of Dos Playa there are grottoes to explore. In the island interior are strange monoliths of diorite. Several old gold shafts and their deserted ruins may be seen at Bushiribana and Balashi. The arched rocks on the north shore have been carved by the ceaseless surf on the limestone ledges. Palm Beach at the west end of the island lies in a curved section of shoreline, its three-mile beach of fine white sand protected by a coral reef. Swimming and sailing there will be no less inviting when present plans for a "first-class modern hotel and casino" have developed the quiet bay into a tourist resort.

The island of Bonaire forms a striking contrast with its industrialized neighbours. Though nearly twice the size of Aruba, it has a population of only 5,500. Like Aruba, it is administered by a Lieutenant-Governor responsible to the Governor at Curaçao. The neat Dutch capital of Kralendijk is colourful, cooler and more leisurely than Willemstad. Its quiet streets are shaded by tamarinds and trees whose calabashes eventually appear in orchestras.



This woman is one of the few Carib Indians left on the island of Aruba.

Most of the islanders are Carib Indian by descent, and are deeply religious. The hospital in Kralendijk and the schools are in the hands of Roman Catholic missions. The younger and stronger Bonairians have flocked to work at the oil refineries of the sister islands, leaving a population in which women outnumber men.

Bonaire appeals chiefly through its quietness and restfulness. A rural peace pervades the narrow roads lined with cacti as tall as telephone poles; Indian Head cacti scramble over the rocks, and at least three kinds of cacti grow in every vacant lot. Scraggy, wind-blown dividivi trees stand out dramatically against the low skyline.

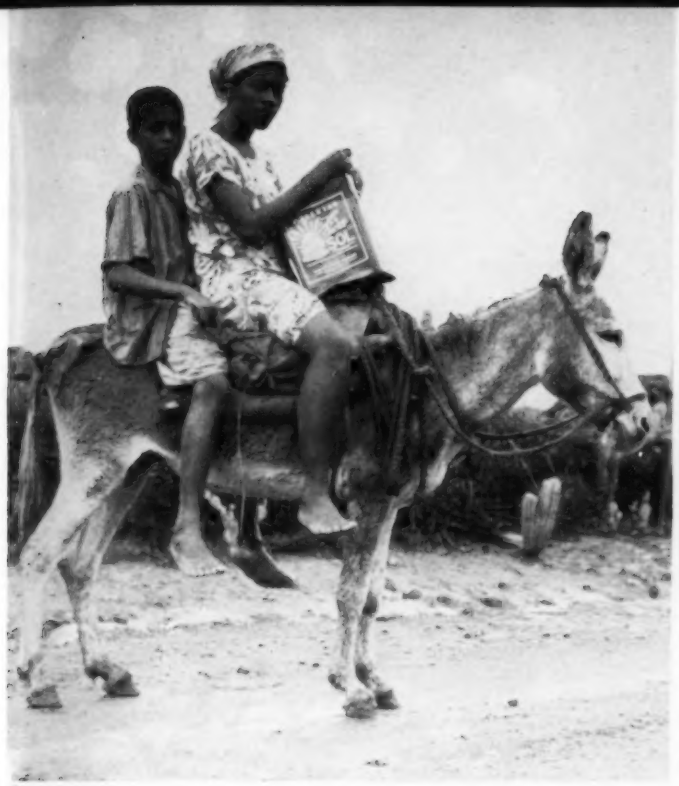
The island is shaped like the letter "L", with its capital tucked into the angle. Little Bonaire Island protects the town from the rare storm, but is itself uninhabited except by goats. Bonaire's agricultural produce is inclined to be of the home-garden variety; but it includes aloes (used in medicine) and dividivi beans (used in tanning). Little black pigs, thin goats and sheep are raised for local consumption, and for sale in Curaçao. Fishing is carried on by a few, and some inhabitants manufacture charcoal, which is the principal fuel of the islands.

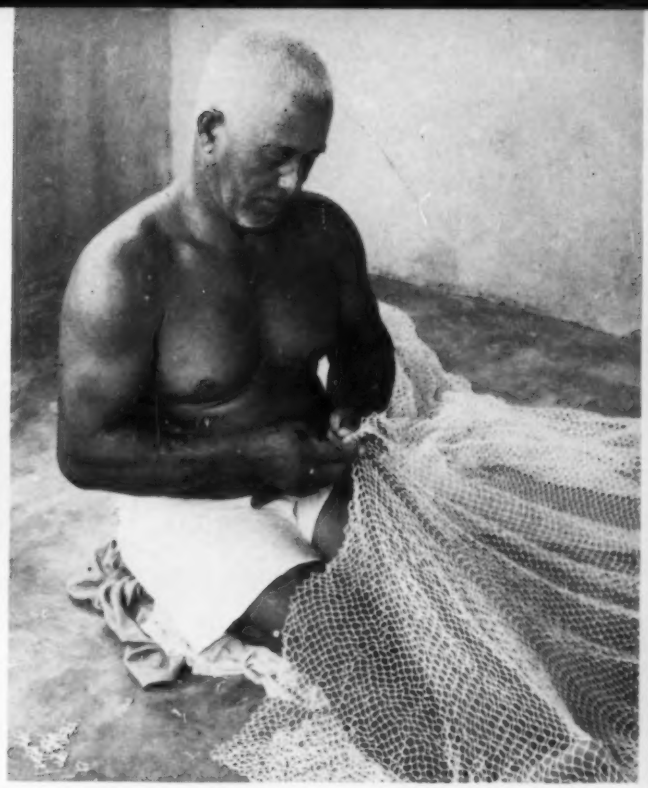
In slave days and up until recently, salt was a valuable product. Along the south shore are several "salt pans" where the salt was dried. Three obelisks of red, white and blue stand there solitary where once schooners moored to take on their loads. There, too, are the tiny empty slave huts, not more than six feet square. But throngs of birds inhabit that flat area which shimmers with mirages and slopes off so gradually into the sea that it is impossible to tell where the land ends.

Bonaire is sometimes called the "Island of Flamingoes", owing to the presence of several large colonies of these birds. Some may be seen at the south end of the island, near the Lacre Punt lighthouse. But more are found northwest of Kralendijk at the very salty Goto Lake. The long-legged rosy-plumaged birds take alarm very easily. A shot fired into the air—not at them, for they are protected—fills the sky with a host of the brilliant creatures, so that it appears to be coloured by an immense fire.

As gaudy and bright as a juke-box are the striped, multicoloured tropical fish of the vast land-locked bay called Lac, with its popular picnic beach. Along the north shore of the island are a number of interesting caves, noted for their mystical Indian inscriptions. A large cave at Spelonk contains several hundred drawings. In one of the half-dozen caves near Onima, the drawings are especially clear, done in red on a brilliant yellow background. Most are geometric in design, though some resemble crabs, snakes or fish. Very little is known of their meaning.

Bonaire comes nearest to the prophecy of the hard-headed "realists" of forty years ago. Yet all three islands have risen out of the decline and obscurity which seemed inevitable at that time. Prosperity due to oil may eventually prove as fleeting as prosperity based on sugar or on the slave trade. But the little islands of the ABC group will still retain those charms of a friendly people, of cooling trade winds, of white sandy beaches on which the Caribbean ever washes in long, slow surges.



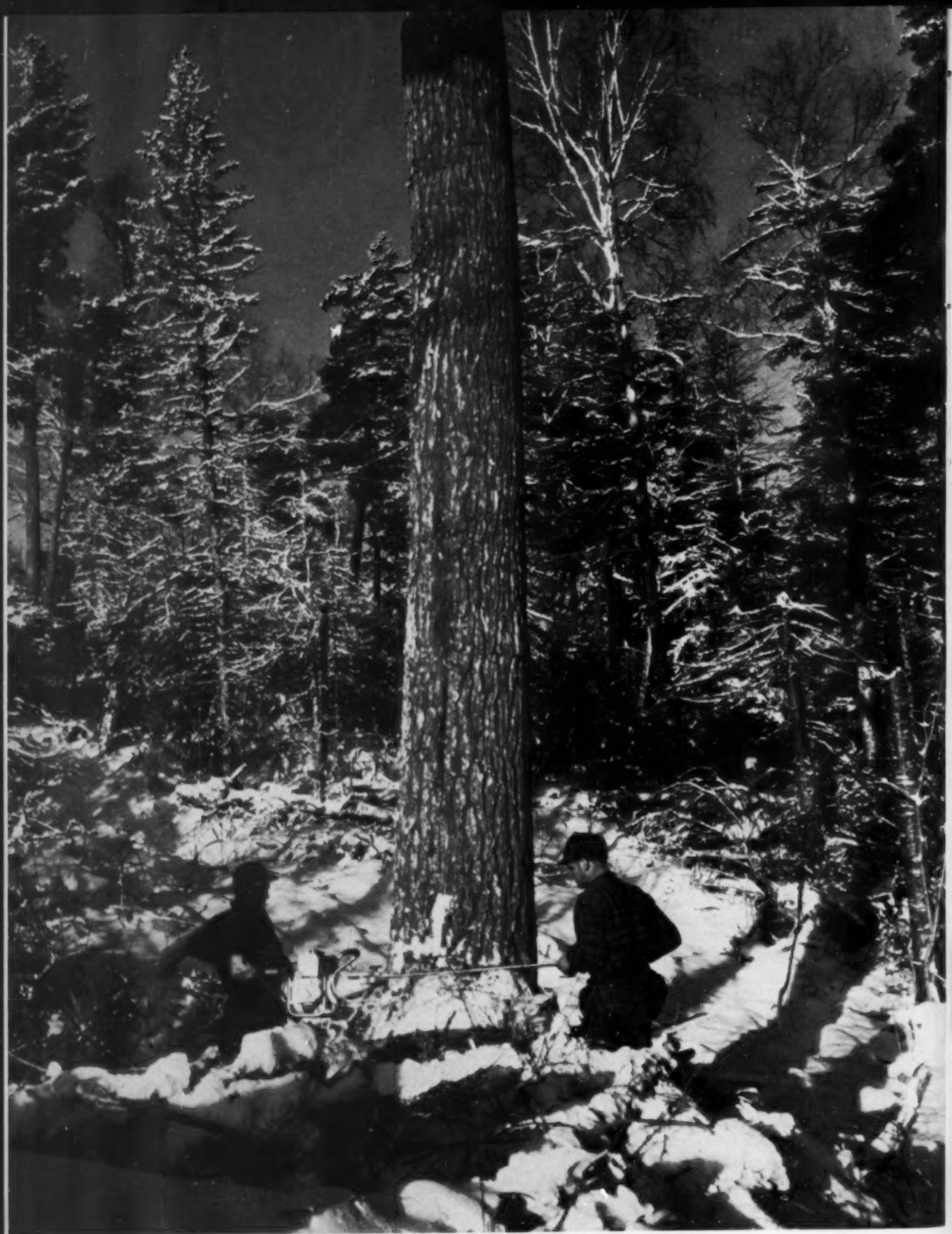


Above left:—On Bonaire donkeys still provide the principal means of inland transportation.

Above:—A Creole fisherman of Bonaire seen cutting the new net he has just bought into two. Fish of all sizes, shapes and colours form the bulk of the daily menu on this island.

Above:—A fish market at Kralendijk, capital of Bonaire.

Right:—A view of the waterfront of Kralendijk, with Fort Zoutman in the rear.



Winter woods operations in Northern Ontario: cutting white pine.

Forest Research in Ontario

by A. P. LESLIE*

Introduction

THE GOVERNMENT of Ontario is convinced of the vital place of the forest in our economy — in maintaining stream flow, in the production of wood and game and fish, in recreation. It is logical therefore that the Department of Lands and Forests should devote considerable time, money and effort to searching out useful facts and ideas for handling our forest lands and their products, and to developing new products and new uses for old products. In general, private industry will take care of the development of products that can be sold profitably, but the long-term job of maintaining and renewing the basic forest is so widespread in scope and importance that it requires co-operative support and intensive scientific research and investigation.

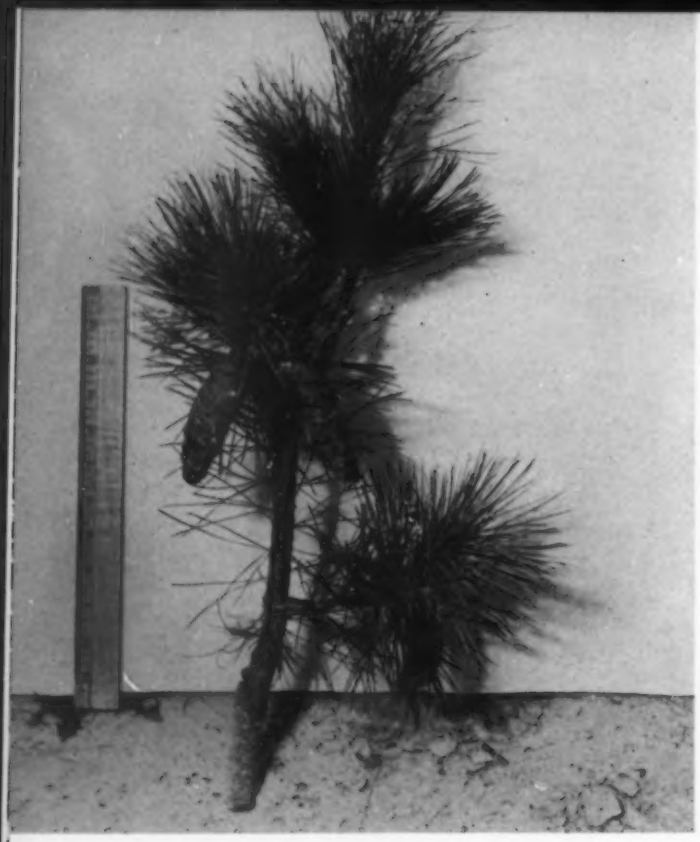
The Ontario Department of Lands and Forests is a large and complex organization that covers many fields. Since 1941 a separate Research Division within the department has carried on forest research in harmonious co-operation with many bodies interested in the maintenance and improvement of our forest wealth. Among those with which the department has agreements are the University of Toronto, the National Research Council, the Forestry Branch and the Division of Forest Biology, Ottawa, the Research Council of Ontario and the Federation of Commercial Fishermen.

The purpose of this article is to outline some of the scientific investigations that have been undertaken by the Research Division of the department, investigations that have increased the efficiency of the department and have contributed in no small way to the immediate and the future economy of the province.

In the past seven years the Division of Research has grown from two to forty-four permanent employees, with three resident research foresters at Port Arthur, Cochrane, and Dorset. In 1944 a Research Station was established near Maple, Ontario, to provide a mechanical workshop and office and laboratory space and facilities for silvicultural and soil research, tree breeding, seed treatment, and wildlife food plant research. Space is also provided for the Lake Simcoe District office, the central radio station and parts of some other divisions of the department.

Right:—Three-year grafts of blister-rust-resistant white pine on which cones have already started to grow.

*Grateful acknowledgment is made to the following for valuable contributions in their respective fields: Norman. R Baldwin, M. H. Baker, G. H. Duff, C. D. Fowle, C. C. Heimburger, G. A. Hills and L. M. Morrison.



Cone-bearing stock grafted onto young white pine—Southern Research Station, Maple, 1951.

Forest Tree Breeding

White pine was the mainstay of Ontario economy for over a hundred years. It has declined in importance but the decline can be checked and this useful species retained if two enemies are overcome — the white pine blister rust, an introduced fungus disease, and the white pine weevil, a native insect pest. The search for a strain of white pine resistant to the disease and the insect is the main activity of the tree breeding section of the Division of Research.

Strains of mature white pine resistant to blister rust and weevil have been located in Canada and in Europe. Grafts from these resistant trees are made at Maple for further testing of resistance. Several exotic white pine species are being grown and tested for any inherent valuable characteristics that might be used to advantage in broadening the breeding project. Of these, the Himalayan white pine and the Macedonian white pine seem to offer the greatest promise.

A method of outside grafting of white pine has been developed and put into use, making it possible to top-graft young trees in plantations with scions from selected superior trees for the production of pedigreed seed in so-called 'seed orchards'. The present work consists largely of the assembling of breeding materials; their evaluation by means of various tests and the selection of the most promising strains for rapid propagation. Seeds have been collected from several outstanding trees and stands in different parts of Ontario and elsewhere, and the seedlings have now been set out in several plantations, mostly in Southern Ontario, to find the most promising strains, which later could be used directly for seed production and for further breeding work. Crosses, both within the native white pine and with several exotic species, have been made and hundreds of hybrid seedlings are growing.

The grafting of new material in the

Dr. C. C. Heimburger covering the flowers of artificially fertilized white pine to prevent accidental pollination.

A hybrid of silver poplar and large-toothed aspen showing growth of ten feet in one year.

greenhouse is now progressing at a rate of about two thousand grafts a year, and outside grafting is rapidly increasing to about the same number. A very large collection of a wide variety of white pine types is thus assembled which should give ample scope for selection of superior material in the near future. Some of the older grafts are now flowering and setting fruit and this is immediately being utilized for breeding work. As such grafted stock is being accumulated, more breeding work on the grafts can be expected.

Another activity of the tree breeding section is the development of an aspen poplar hybrid of good form, good wood colour, disease resistance, and rapid growth.

The aim of poplar breeding is to produce aspen poplar hybrids suitable for growing in Southern Ontario and producing high-quality wood for which there is an increasing demand by industry. Although there is plenty of high quality aspen in Northern Ontario, it has not been possible to grow this tree farther south because of its exacting climatic requirements. It appears necessary to produce entirely new aspen poplars by breeding. This is being accomplished by crossing aspens with silver poplar, a species native to southern Europe. Several forms of European and Chinese aspen are also being used in some crosses. A number of natural hybrids between silver poplar and the native large-tooth aspen have been found and some of these appear very promising in combining very fast growth with good form. This cross is being repeated artificially on a rather large scale, to find still better hybrids among the seedlings.

Another promising cross is between European aspen and native trembling aspen, of which several hybrids have been produced utilizing pollen of European aspen shipped by air mail.

Since aspen poplars cannot yet be propagated successfully by means of stem cuttings, research into practical methods of vegetative propagation from root cuttings appears promising. Some forms of silver poplar root fairly well from stem cuttings and this character is being incorporated into the aspen hybrids by breeding. A fairly large collection of native aspens from Canada and the United States and of European aspen and silver poplar from various European countries has been assembled and is increasing annually. Several promising forms have been found, and five of these are being propagated for direct use in forest plantations and for breeding purposes.

The tree breeding section has a third and lesser activity. It is establishing an arboretum containing breeding materials of all the most promising types of white pine and related species that have been tested in the nursery for resistance to blister rust and hardiness. These are mostly grafts on established stock in a plantation that has been set out previously for this purpose. A fairly large collection of poplar materials has been set out into an arboretum, for further observations of growth rate and growth form, as well as resistance to several diseases. Experiments with the use of dwarfing stock, to encourage early and abundant flowering of such material, are under way.

Dr. G. H. Duff starting an experiment on the carbon-dioxide exchange of germinating pine seeds.

Red Pine Seed Production

Red pine is one of our most valuable trees for reforestation but unfortunately it is a poor seed producer. It produces seed only every six to ten years and then yield is not always good. The Department of Lands and Forests decided to apply modern techniques to the study of this species and try to select superior strains for growing in plantations where treatments to increase production and protect the seed from insect pests can be given. This work is carried on by the Division of Research in collaboration with the University of Toronto, the Research Council of Ontario and the Science Service of Canada.

Seed destroying insects are among the factors reducing the yield of seed. These insects are being examined scientifically and it is hoped that when their life histories are known it will be possible to control them.

It is clear that silvicultural management for the control of pests and also perhaps of cone production would be impossible under natural conditions. But nature may be taken into partnership by man, and trees trained to meet his needs. Accordingly, the progeny of productive races of good characteristics are being collected and propagated to be placed in special plantations for seed production. The requirements of such plantations are being studied in experimental 'seed orchards' under a variety of conditions.

The researches on red pine seed production have necessitated examining the development of the cone from its earliest microscopic beginnings. The cone originates in August at the growing point in the interior of the terminal bud. It remains enclosed in the bud during the winter, emerges from the bud the following spring and pollination occurs immediately thereafter. A year then elapses before the stage of fertilization is reached. By this time the cone is half grown or less. Thereafter it grows rapidly and matures seed in the autumn of the second year after emergence. The whole story of cone and seed formation is thus spread over the growing seasons of three years, a fact that obviously complicates the study of the many factors controlling seed production.

The production of a cone, like the production of a branch, is a phenomenon of growth. The various growth processes of a pine tree, like those of any other plant, react upon one another and it is not possible to study the factors controlling any one growth process in isolation. The researches on cone production must therefore become researches on growth. In the course of these some interesting side-lights have been thrown on the growth of wood. The ease with which terminal growth may be modified by external conditions led to experiments with hormones, fertilizers, grafting, pruning and girdling to influence both height and diameter growth.

The characteristics and life processes of the seeds themselves are important and have therefore come under investigation. The course and vigour of germination, for instance, depend upon the course and vigour of metabolism in the embryo. This can be determined in the laboratory by following the gaseous exchange ('breathing') of seeds by germinating them under various conditions. By this means the water and oxygen requirements of the red pine seed have been determined; the latter have been found un-

expectedly interesting and complex. The biochemical life-process of the germinating seed of the red pine has been examined to a point at which it is probable that more is now known about the life process of this than any other species of forest tree.

Fisheries

Beneath the surface of the innumerable lakes and streams of Ontario exist intricate patterns of life which are rarely seen. Hidden as they are from direct observation, relatively little is known of our fish and the factors which control their abundance. Because of the tremendous value of our fisheries both for commerce and for recreation this information is vital if management of this asset is to be efficient. Knowledge of the physical, chemical and biological conditions in our waters and their effects on our fish is increasing. The department in co-operation with other agencies is carrying out research at three locations: the laboratory for experimental limnology at the Southern Research Station, Maple; the South Bay experimental station on Manitoulin Island; the Opeongo limnological laboratory, Algonquin Park.

Headquarters for the fisheries research work of the department is at the Southern Research Station, Maple, where in co-operation with the University of Toronto, a laboratory is operated. This laboratory, completed in 1949, was designed primarily for investigations of fish physiology. These studies are aimed at discovering what conditions of temperature, amounts of dissolved oxygen and other environmental factors favour game and commercial fish.

This laboratory also provides facilities for the chemical analysis of waters from lakes in Algonquin Park and the South Bay area.

A variety of research material collected in the course of field operations is examined in the laboratory. The stomach contents of various species of fish are analysed in order to assess the degree of competition for food and possible predation. Egg counts are made to measure the fecundity of the fish. Fish scales are mounted on slides and examined under a microprojector to determine age.

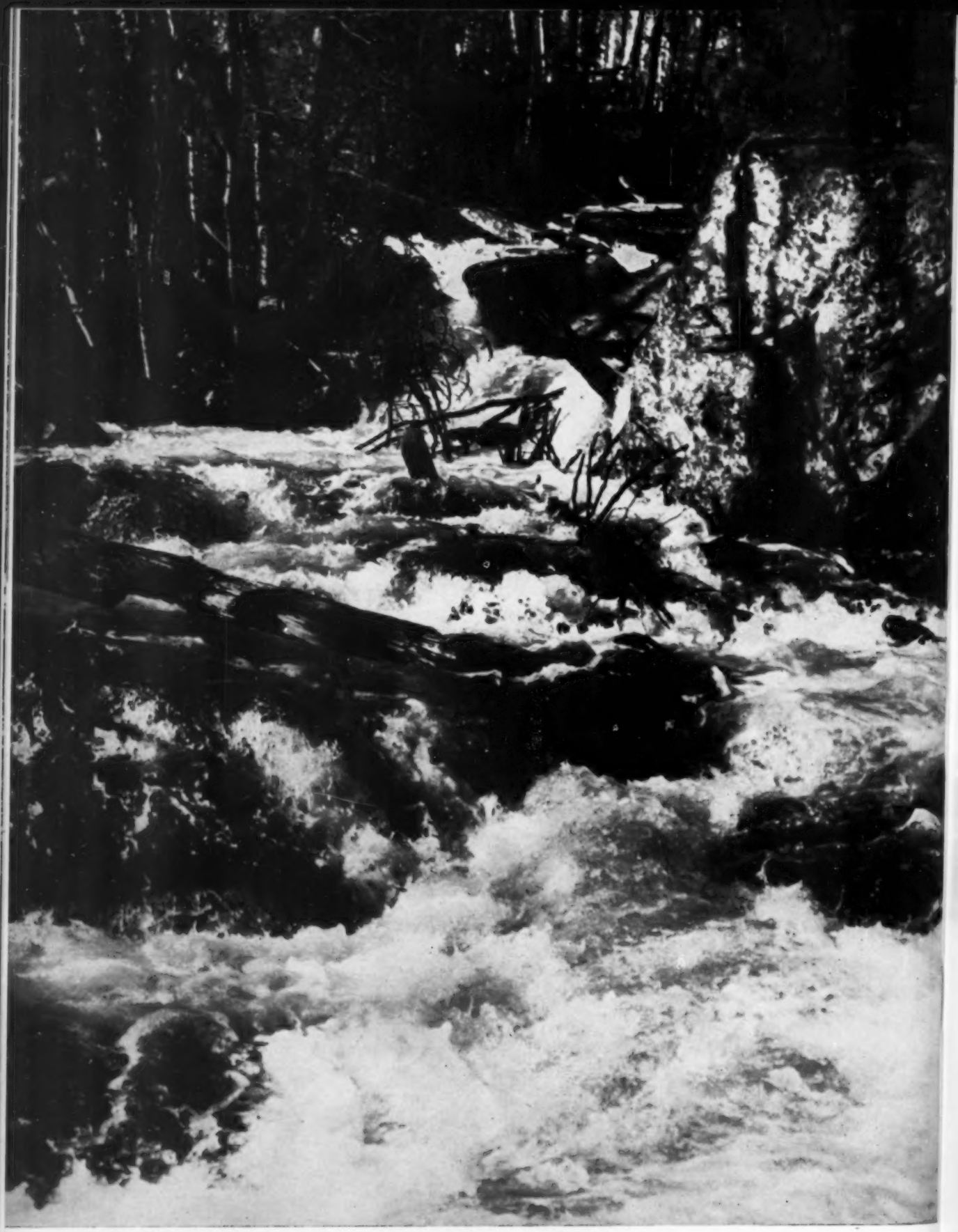
The South Bay project was begun in 1947 at the request of the Ontario Federation of Commercial Fishermen, who were alarmed at the disastrous decline of the Lake Huron and Georgian Bay fish.

South Bay is an arm of Lake Huron about 37 square miles in area; its connection with the lake is a narrow channel 300 yards wide. It is thus an almost isolated body of water but open to all species of fish found in Lake Huron. Information obtained on fish populations in the Bay would be applicable in many respects to the balance of Georgian Bay and in fact to the whole of Lake Huron.

The primary object of this research was to discover whether the removal of quantities of undesirable species of fish such as suckers, smelt, ling or burbot would benefit the populations of desirable fish such as lake trout, whitefish and small-mouth bass.

It was suspected that a comparatively recent addition to the fish population of the upper lakes, the smelt, might be in part responsible for the failure of the fishery in Lake Huron and Georgian Bay by eating the young of the commercial and game

Pulling in a pound net, as part of the South Bay experiment, Manitoulin Island.



The white waters of Northern Ontario prove an irresistible attraction to fishermen of both Canada and the United States.

species. In the spring of 1948 and succeeding years an attempt has been made to reduce the numbers of smelt in the South Bay by removing them as they come up the streams and freshets to spawn.

The experiment is under the general supervision of an advisory committee composed of representatives of groups interested in the fisheries of Ontario. The actual fishing operations are directed by a committee of commercial fishermen and the scientific investigations are conducted by the Division of Research.

A creel census has been carefully kept for South Bay and also for Lake Manitou to compare managed and unmanaged sport fisheries. There is not the slightest indication that the experimental fishery operations in South Bay have in any way adversely affected the survival of the game fish. It is however too early yet to see any beneficial results.

Lake trout and bass tagging has provided measures of the growth of individual fish in the interval between their release and recapture; estimates of the natural mortality in South Bay; confirmation of the estimation of ages of fish by identification of winter marks on their scales and relative efficiency of various nets in capturing fish of different sizes. From this information it is possible to make a tentative prediction of how large the younger year classes coming into the fishery may be.

In 1949 experimental work on the utilization of fish which are not used at present and on fish wastes was started. This work has been continued and expanded. Sucker fillets and whole smelt have been quick frozen in pound packages wrapped in cellophane. Trial shipments offered for sale have met with fair success. Smaller smelt have been frozen in bulk to be disposed of as experimental animal food. Cooked smelt and sucker waste have been prepared as food for mink.

In addition to the studies of fish, continuous records have been kept of the environmental conditions in which the fish live. A series of water and air temperatures has been taken every year, making use of improved instruments as they could be obtained. Wind directions, measurements of water levels, rainfall and rate of evaporation have been recorded.

The South Bay Experiment is really to be regarded as a pilot plant and what is learned there will be applied in other parts of the province with whatever modifications may be necessary.

Tagging a lake trout at South Bay.

The laboratory at Lake Opeongo in Algonquin Park was established in 1936 by the Ontario Fisheries Research Laboratory of the University of Toronto at the request of the department. At the present time an extensive program of fisheries research is being carried on at this laboratory through the co-operative support of the Department of Lands and Forests, the University of Toronto, the National Research Council and the Research Council of Ontario. Detailed investigations are being made of the factors that control the production of game fish in the lakes and streams of Ontario's Northland. A fish management policy is being developed for the variety of fish populations present. Experimental modifications of the environments are being attempted with a view to improving conditions and increasing the supply of game fish in certain of these relatively infertile waters.

Much of the early field work consisted of the collection of information on the fish themselves. At the same time, however, it was essential to obtain a knowledge of the physical and chemical conditions under which the fish populations lived. A creel census was started to obtain information on game fish in the lakes near the highway from which it was soon evident that the fish populations differed greatly from lake to lake. The feeding habits and growth rates of fish in adjacent waters were often found to vary greatly. In some waters lake trout matured and spawned at 13 inches while in other lakes faster growing fish spawned at 18 inches. This information was useful in determining the effects of heavy fishing pressure over a period of years and valuable in determining what measures might be successful in maintaining and improving angling.

As the years have passed the long-term records have become extremely valuable in the assessment of change in fish population in a number of lakes. The sustained production of trout, generally less than two pounds per acre annually, has been determined for a number of lakes. Enough information is at hand to predict future fishing conditions in some lakes several years in advance.

The results of different management techniques such as restocking, closure to fishing, and lake improvement are being closely studied to discover their effectiveness, and modifications of these techniques are being evaluated.

Concentrations of inorganic chemicals, which are fundamental nutrients in lakes as on land, are being determined in a number of lakes and are also being increased in selected test lakes by the addition of chemical fertilizer. This is being done in an attempt to increase the crop of game fish. Samples of microscopic plants which utilize these chemicals indicate that fertilization increases their numbers. Microscopic animals and organisms inhabiting the mud bottoms have also increased many fold. There is evidence too that small fish, the food of game fish, have increased in abundance and in rate of growth subsequent to lake fertilization.

Microscopic plants or algae are dependent not only upon dissolved chemicals but also upon the amount of light which penetrates the water to the depths at which they live. Measurements of light penetration which have been made on a large number of lakes in Algonquin Park in the past three years indicate that the surface layer capable of producing plant growth varies from about one yard in highly coloured lakes to about seven yards in clearer waters. It is probable that the addition of fertilizer to the highly coloured lakes would not increase their productivity significantly since the radiant energy available to the algae is so small. An attempt is being made to reduce the colour of the water of such a lake by the addition of hydrated lime and dolomitic limestone. There has been an appreciable decrease in the colour of surface waters and a corresponding increase in the penetration of sunlight. It is expected too that the decrease in acidity caused by the lime will free nutrient materials from the bottom sediments of the lake.

FISHERIES RESEARCH OPERATIONS AT LAKE OPEONGO, ALGONQUIN PARK

Above:—A machine used for sampling microscopic water organisms.

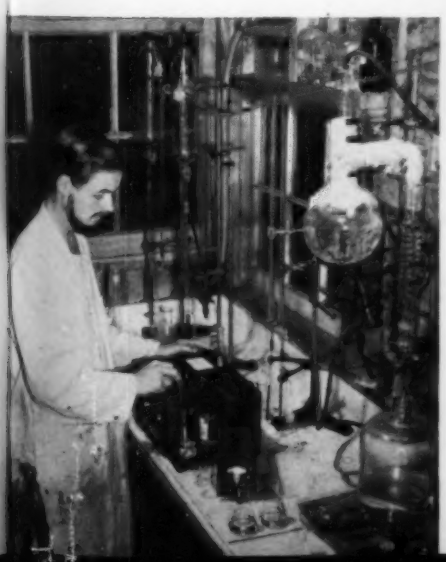
Above right:— Taking water temperature measurements.

Right:—The Fisheries Research Laboratory.

Below:—Making a chemical analysis of lake water in the laboratory.

Below centre:—Biologists examining samples of lake bottom for fish food content.

Below right:— Taking samples of water at various depths.



Wildlife

To most people the term "wildlife" conjures up pictures of deer, moose, grizzlies, grouse, pheasants or other game species, but in a broader sense, it can be applied to all birds and mammals. If this more general definition is acceptable, we may define wildlife management as the business of controlling populations of birds and mammals to the advantage of mankind. However, the term wildlife is usually used in a restricted sense to refer to game and fur species which provide an annual or periodic harvest. Thus most wildlife managers are faced with the problem of managing the land and water so as to produce the best crops of wildlife on a sustained yield basis in a way which is consistent with the use of land and water for other purposes. Some knowledge of the habits and requirements of the animals to be managed is, of course, basic and it is here that wildlife research comes into the picture.

In a government organization the chief functions of wildlife research are to cooperate with the manager and administration by making available to them both the data gained through research and the facilities for scientific and experimental investigation of specific problems, and to disseminate information to the public in order that understanding and enjoyment of this great natural resource may be increased.

In government departments whose main responsibility is for game and fur only, wildlife research may be confined to certain species. In a department with the diversified responsibilities of the Ontario Department of Lands and Forests, the research biologists have been called upon to deal with such varied topics as the methods of controlling mouse damage in reforestation plantations, the influence of grouse hunters in starting forest fires, the migration routes of woodcock, the effects of temperature on the activity of mice, the factors limiting the number of deer in an area, methods of measuring pheasant populations and the food habits of game, fur-bearing and predatory animals.

Wildlife research originated within the department in 1944 with the establishment of the Wilderness Area in Algonquin Park, as a centre of research. The Wilderness Area offers exceptional facilities for long-term studies of animal populations and the relationship between animals and their surroundings. The area supports a wide variety of vegetation types in which well over 100 species of birds and 32 species of mammals have been found. The facilities are used by scientists from several organizations as well as by department personnel. In 1947 the program was expanded to include projects at various other locations in the province.

In general the program has included two types of investigations, those from which basic information relating to the broad principles governing the habits and relationships of animals are obtained and those relating to pressing problems which require immediate solution. The accumulation of information relating to wildlife is usually such a slow process that it is not generally

Opposi

Below:—Trapping live beaver for shipment to other waters.

Above:—A conservation officer releasing live beavers that have been transferred to this area by aircraft.

possible to complete an investigation in one year. Many phenomena such as fluctuations in animal populations, changes in geographic distribution, and changes in population density and composition accompanying changes of environment become apparent only from long-term studies. Moreover, since the habits of animals change continuously throughout the season through cycles of breeding, moulting, migrations and so on, it is almost impossible to repeat observations or experiments under similar conditions in one year.

Studies of bird life have included the development of methods for estimating bird population in the forest and comparisons of population composition and density in various forest types. The influence of birds in the forest environment as destroyers of insects, transporters of seeds and so on is largely dependent upon the kinds and numbers present. These investigations have shown that the bird fauna of the Algonquin area is transitional in nature between that found in the more southern hardwood forest area and northern coniferous forest. Species such as the Canada jay, Arctic three-toed woodpecker, and brown-capped chickadee are representative of a northern fauna while the southern fauna is represented by such species as the indigo bunting, brown thrasher and a variety of warblers. This mixing of bird species is related to a similar blending of northern and southern tree species in the forest.

Since 1945 over 600 birds have been banded on the Wilderness Area by the Royal Ontario Museum of Zoology and by

Opposite:—The trap (left) *used for taking live grouse and the net trap* (right) *for prairie chicken both serve research purposes.*

the department. This project is part of the co-operative program sponsored by the governments of Canada and the United States in order to secure information on migration.

Another investigation has contributed to our knowledge of one of Ontario's important game birds, the ruffed grouse or 'partridge'. As a result of studies of a number of individuals, including some which were marked with coloured dyes and leg bands, it has been found that the male ruffled grouse usually restrict their movements to an acre or two in spring but wander more widely over an area up to twenty acres or more later in the summer. The females with broods of young tend to wander widely in a habitat which differs somewhat from that of the solitary males.

This investigation has been closely co-ordinated with an experiment conducted on an island in Lake Huron. A number of what are believed to have been parasite-free ruffed grouse, which were reared at one of the department's game farms, were liberated in the late summer of 1950. It is planned to study the development of this isolated population in the hope of securing information on the causes of the periodic fluctuations in numbers of grouse, habitat selection and the role of parasites and diseases.

The phenomenal production of pheasants on Pelee Island has naturally attracted research workers to search for the factors responsible for this extraordinary success. Studies of reproduction, population fluctuation and habitat are presently being carried on.

The white-tailed deer is the most important game animal in Ontario, being sought by about 90,000 hunters during the hunting season of 1950. Studies of its life history, habits and relationships with the forest were begun on the Wilderness Area in 1945 and were later extended to the province-wide survey of deer management problems and an intensive study of local conditions in the northwestern part of the province.

The recent decline in beaver population in the Severn River drainage of Hudson Bay has led to an investigation of the nature and cause of the decline.

The problems of wildlife management in Southern Ontario are no less pressing than those in the forested areas in the north. The industrial and agricultural developments in the south have greatly curtailed wildlife habitat so that today the restoration of adequate food and cover facilities for wildlife is one of the most urgent problems of management. Investigations of methods of restoring habitat are being carried on with particular reference to food and cover plants.

The layman is often surprised to discover that in addition to the larger mammals such as the deer, bear and raccoon, the forest is the home of a dozen or more species of small shrews, moles and mice which are seldom seen by the average observer. These animals by virtue of their numbers constitute an important element in the forest fauna. In so far as forestry is concerned, such species as the squirrels, chipmunks and deer mice serve as distributors as well as destroyers of tree seeds. In the well stocked forest there is, of course, a huge surplus of seed produced from which the animals may draw some of their food supply without reducing successful forest reproduction. There are some cases, however, such as in direct seeding operations in burned or cut-over areas or on experimental seed plots set out in the forest, where the depredations of small mammals may all but nullify man's efforts to restore the trees by seeding. It is for this reason that investigations of methods of controlling small mammal damage to seeds have been undertaken. This work has included the study of such things as the reactions of captive small mammals to chemically treated seeds and to seeds planted at varying depths. So far no successful technique has been perfected but our understanding of how the animal finds seeds and responds to chemical and other repellents has been greatly increased.

AT SWAN LAKE

Far left:—Measuring yellow birch seedlings.

Left:—Trunk of a full-grown old yellow birch.

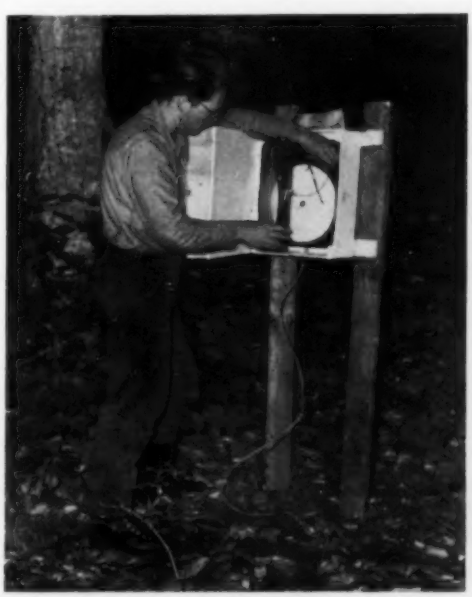
Silviculture

Silvicultural research was first started in Ontario in 1929 and continued until 1934 when for reasons of economy the staff was dismissed and the work discontinued. Some 150,000 acres of cut over and burned over land in Algonquin Park, North Bay, Sudbury and Sault Ste. Marie had been surveyed to study the pine and spruce regeneration. This was considered to be the first step in silviculture to find how the forest was being restored. In 1941 the research section was revived but no staff was available until 1944 when the present division of research was established under a full time chief. It was not until after the war that technical help in sufficient numbers was available and work could proceed.

Regeneration surveys were renewed in the North Bay, Cochrane, Port Arthur, Kenora and Fort Frances districts. These were continued until 1947 when some of the ideas arising out of the field work were put into practice in the districts of Port Arthur and Geraldton. Here experimental cuttings, seeding and planting and slash burning were started on the limits of the larger companies as a result of the lessons learnt in the earlier regeneration surveys. This procedure was again followed in the Cochrane area in 1950 where an experimental cutting system was set up on an operating limit.

Since 1929 efforts have been made to get small research centres established in each ecological region in which problems might be attacked without prejudice to any operations. A start has been made in Port Arthur and Cochrane where small plots of abandoned land have been set aside as research areas.

In Southern Ontario following the regeneration surveys a special study of yellow birch has been started at Swan Lake near



AT SWAN LAKE

Right:—Consulting a soil-temperature recorder.

Far right:—Yellow birch research worker using a light-intensity recorder.

A Swan Lake research party engaged in yellow birch studies.

Dorset. Here all the factors governing the germination, survival and growth of this important species are being studied and several significant discoveries have been made.

White pine is also one of the main problems of the southern region. At the request of the Timber Management Division a close study of this species is being made at the Petawawa Management Unit, in respect to methods of cutting or other treatment that will yield sufficient reproduction, and the degree of cutting or other stand opening that will give maximum growth.

A generalized summary of observations on regeneration to date follows:

White and red pine and white spruce and jack pine and yellow birch are generally unsatisfactory after logging and especially after clear cutting. White pine and white spruce and, to a lesser extent, red pine reproduce well in old fields in the southern part of the province as far north as Bracebridge and up the Ottawa valley as far as Temiskaming and along the shore of Lake Huron as far as Sault Ste. Marie. This condition is usually found in the more open textured soils adequately supplied with moisture. White pine and white spruce and red pine may be regenerated in forest stands on similar soils at least as far north as Timagami by a two or three cut removal of the stand.

Jack pine is everywhere unsatisfactory after cutting though considerable improvement is noted after mechanical logging where cones are opened by being brought close to the ground and the seed from the open cones is buried by the soil disturbance.

Yellow birch is generally unsatisfactory after logging. Although this species germinates prolifically, often in the millions per acre, many factors usually operate to reduce this germination to zero within a short time. Several discoveries have been made that will have important results in handling this species.

Black spruce in the swamps of the north reproduces well under almost any condition of either clear or partial cutting. The germinating characteristics of this species plus its heavy seed production and rapid growth are making it a favourite for nursery work and planting in the forest even on drier sites.

These studies of regeneration and the work that issues from them are not the only ones that occupy the silvicultural section. The preparation of tables of volume and the measurement of growth and yield also is under way.

The problem of defective hardwoods that cover such a large part of the central highlands of Southern Ontario is receiving much attention. There crooked and defective maples with what is known as mineral stained heartwood occupy the hardwood stands almost to the exclusion of other species. Various efforts have been made to remedy this condition — girdling of all defective hardwoods to release those of good form and also some scattered conifers; girdling and the planting and seeding of

conifers on suitable sites. In some places girdling of defective trees is associated with treatment of the site by liming to see if the heartwood staining is a product of a nutritional deficiency.

The reproduction of the forest will always depend mainly on natural regeneration guided by various silvicultural practices but there will always be scope for some planting and direct seeding. The silviculturist is therefore interested in seeds and in methods of making them more effective, such as treatment by fungicides, rodent and insect repellents, fertilizers and hormones. It was thought long ago that a coating might be applied to the seeds that would serve as a vehicle for these preparations and give a more nearly spherical form that would feed readily through a seeding mechanism The problem was twofold: first, to devise a satisfactory non-injurious coating that would not unduly delay germination; second, to put in the various additives. The first part has been successfully solved and a cheap, easily applied coating has been found and a seeding tool made to deposit the pellets one at a time. Judgment on the part of the operator is necessary to select the right location for the particular seeds being used.

Good progress has been made in the addition to the coatings of fungicides to prevent loss by "damping-off" and other fungi. A little headway has been made with the addition of fertilizers and hormones and repellents.

Forest Soils

The contribution which soils research is making to the research program of the Ontario Department of Lands and Forests may be considered in two stages.

The initial problem is one of general classification which will permit a more intelligent direction of the use of provincial lands and in particular will indicate those areas in which forestry and forest crops will dominate the local economy for a relatively long time. The main problem is to assess the land on the basis of forest production and forest use. To some extent, these two operations must go forward hand in hand.

A considerable number of the original objectives of the division have been attained. A land use map has been completed for the province showing potential use for agriculture and forestry and possibilities for the future with changed populations and economic levels. This is based on the premise that there is no absolute forest or agricultural land, that even the best potential agricultural land under some conditions of population and economic conditions is better left to the forest and that some grades of poorer land under some conditions of

A general view (looking northwards) of the Southern Research Station at Maple; the Mechanical Building is lower left, the new Biological Building at centre, and the greenhouse in background.

Checking seed germination and growth in various soils at the Southern Research Station.

development should be diverted to agriculture.

Another development of great significance is a simple and easily applied system of site quality identification by landform, soil permeability, moisture conditions and local climate. The importance of this index is great, as it enables foresters and others working independently to assess the qualities of a site comparably.

Forest site maps on a regional basis have been prepared which outline the divisions of the province by effective temperature and precipitation. These, to a large extent, define the range of species of trees.

The fitting of tree species into the site index classification by moisture regime, physical soil conditions and temperature requirements is under way and this, in turn, leads to the description of forest tree associations and their locations within the forest site regions of the province.

Another objective largely attained is the study of nutrient requirements of forest tree seedlings as an aid to nursery practice in fertilizing and otherwise treating seed beds.

The soil mapping of the province is done by selecting a number of sample areas within each ecological region. Each is carefully mapped on the ground and each site type carefully identified by forest and plant cover and site index. These site types are then identified on aerial photographs. The relationships thus established are used to map the sites on areas which have been photographed but not sampled.

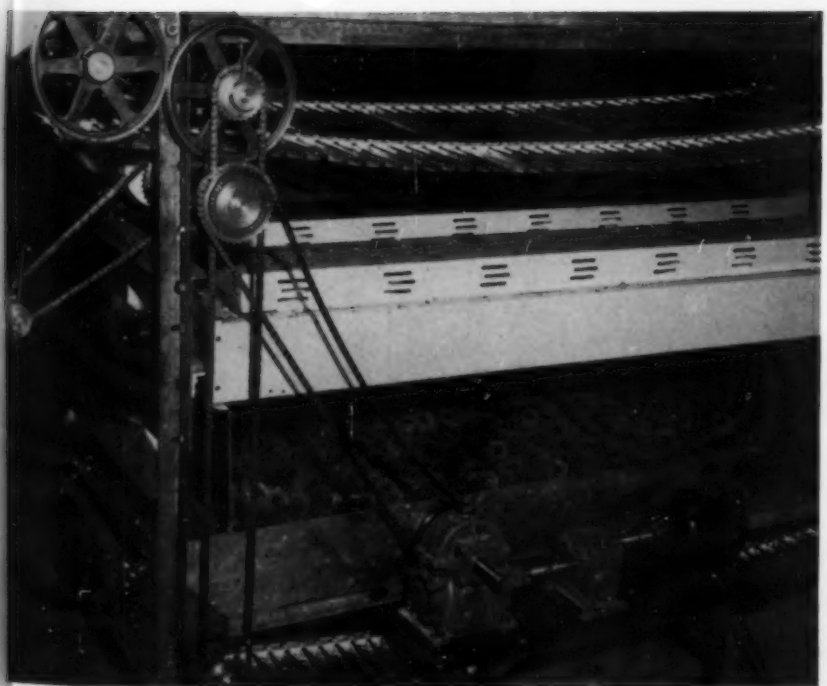
This system has been applied to large areas of northern, western and southern Ontario totalling about six million acres.

Mechanical Research

During the past several years (and prior to the establishment of the Research Division), research and experiment have resulted in the development of various tools and equipment particularly suited to the needs of the department. In particular, major developments have been made in the construction of mechanical aids in the fields of forest protection (radio communication and fire fighting equipment), silviculture, and reforestation.

Following the great Mississagi - Chapleau forest fire in 1948, representatives of the Research Division met with regional foresters and a consultant from industry. At this meeting the foresters were asked what piece of fire fighting equipment they would most

Right:—Testing the second model made of the pack tractor, or "creep"—a recent invention designed to transport fire-fighting equipment through the bush without taxing the strength and energy of fire-fighters. Weighing 650 pounds, it can be broken down into ten pieces, or reassembled, by one man in ten minutes.



Left:—A pilot model of the infra-red-ray tree seed extractor, showing opened cones on the bottom tray. This process speeds production and increases seed recovery.

Left:—Ranger carrying a fire-pump to the fire; it is hoped that the pack tractor will relieve most of this back-breaking work.

like to have. The answer was something that would get power on to the fire line and that would take the load from the fire fighter's back in covering the last mile or so from air, road or rail transport to the fire. The pack tractor or "creep" was built in answer to this demand. This is a crawler or track laying vehicle, five and one half feet long, two and one half feet wide and three and a third feet high, weighing six hundred and fifty pounds. It will carry more than its own weight through the bush with little trail cutting. It can be broken down into ten pieces, the heaviest of which weighs under one hundred and fifty pounds, thus facilitating handling by air transport. The machine can be knocked down or reassembled by one man in ten minutes.

Research has developed a number of mechanical devices to reduce labour, time and cost in forest tree nursery and planting practices. Two such devices are the seedling lifter and root pruner, both of which may be mounted on a large tractor. A steel blade penetrates the ground to a depth of six inches across the full width of the seedling bed. The seedling lifter loosens the soil so that seedlings may be lifted out easily, either for transplanting or direct shipping, while the root pruner cuts the roots a few inches below the surface and stimulates the formation of a compact root growth.

Another device made for the silvicultural section was a seeding probe or "walking stick" seeder for direct seeding of forest trees wherever this method is practicable. This tool is hand operated and light in weight. It punches a hole in the ground and drops a single seed. It is designed to handle coated seeds because they are uniform in size and can be dispensed readily one at a time. Naked seed of some species can be used though not with the same precision, and several seeds may be dropped at once.

In 1947 experiments in the application of infra-red heat to pine cones to improve the yield of seed were commenced. These tests showed better and faster results than the old method. A pilot plant for this work is now in operation at the Provincial Seed Extraction Plant at Angus. Particularly encouraging results have already been obtained on the cones of red pines.

A number of other projects have been or are being carried on, including the following: the "Easifill" fire fighter's pack can, which can be quickly and easily filled in very shallow water; a mechanically operated fire hose folder; a fire line digger, and an aerial seeder for dispensing forest tree seed from aeroplanes. Tests have also been made of hose for resistance to wear and decay, and of carboloy and stellite-treated fire-fighting cutting tools to keep them sharp for a longer time.

Statistics

Until recent years, the department only occasionally used mathematical statistics

Fierce forest fire raging in a mixed wood stand. Thus thousands of dollars worth of valuable timber is destroyed annually.

A walking-stick seed planter, or probe, showing the hole-making plunger. In the glass containers are coated (left) *and naked* (right) *seeds.*

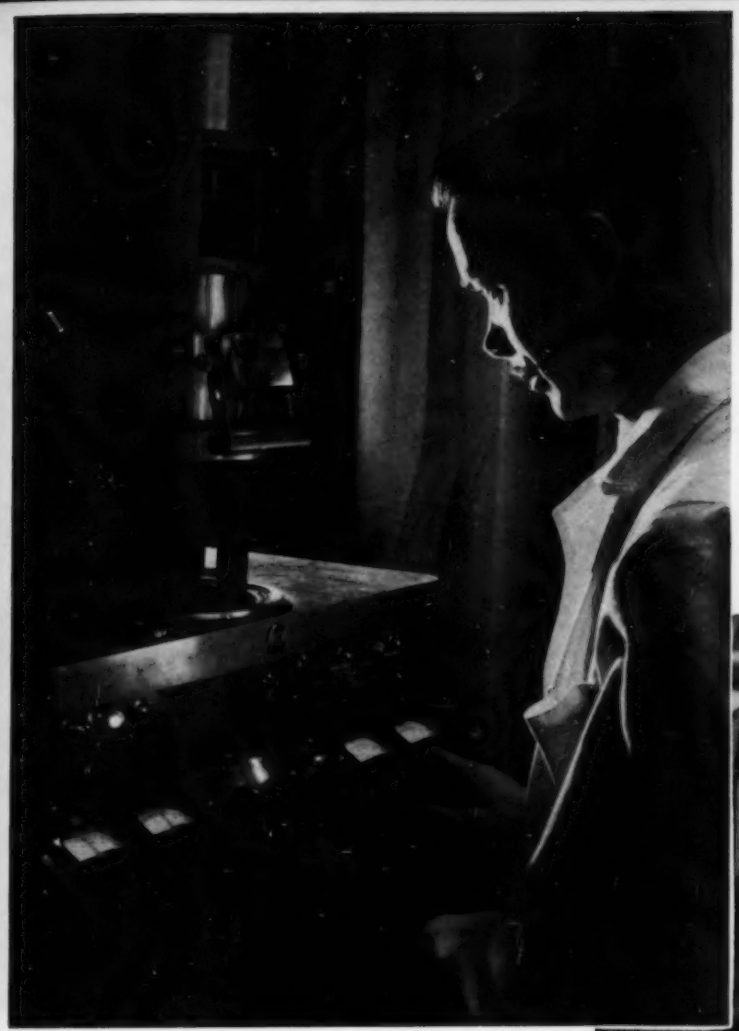
in the formal sense. In 1948, a statistician was appointed to the staff of the Division of Research to carry out studies of the various statistical aspects of the problems of the department.

Already the application of statistical methods in design and analysis has contributed greatly to the success of the various experiments. For example, much assistance has been given to the silvicultural section in the development of methods to ensure adequate sampling and in the preparation of tables of volume and the measurement of growth and yield.

To give an example of a large-scale project, a study was made of the pheasant population of Pelee Island in co-operation with other organizations. The vast collection of data is being analyzed, with the object of determining the yearly rise and fall of pheasant population under the impact of the opposing forces of hatch and mortality. The ultimate objective is to improve management practices with the intention of guaranteeing a sustained yield of game birds for hunting.

Another major project recently concluded was a comparison of the preparation of volume tables for the estimation of timber stands by the alternative methods of graphical curve smoothing and a mathematical formula.

A current project being conducted in co-operation with the Dominion Laboratory of Forest Pathology and the Research Foundation of Ontario is designed to study damage to red pine seedlings attacked by



Left:—At the Sault Ste. Marie Forest Insect Laboratory, Dr. K. Graham uses an electron microscope to examine virus organisms causing disease and death of the spruce budworm. Below:—Larva of the spruce budworm, chief forest-destroying insect of eastern Canada.

damping-off fungi. Results to date indicate that this disease may be brought under control. At present it is a serious deterrent to the production of one of the most valuable trees in reforestation work.

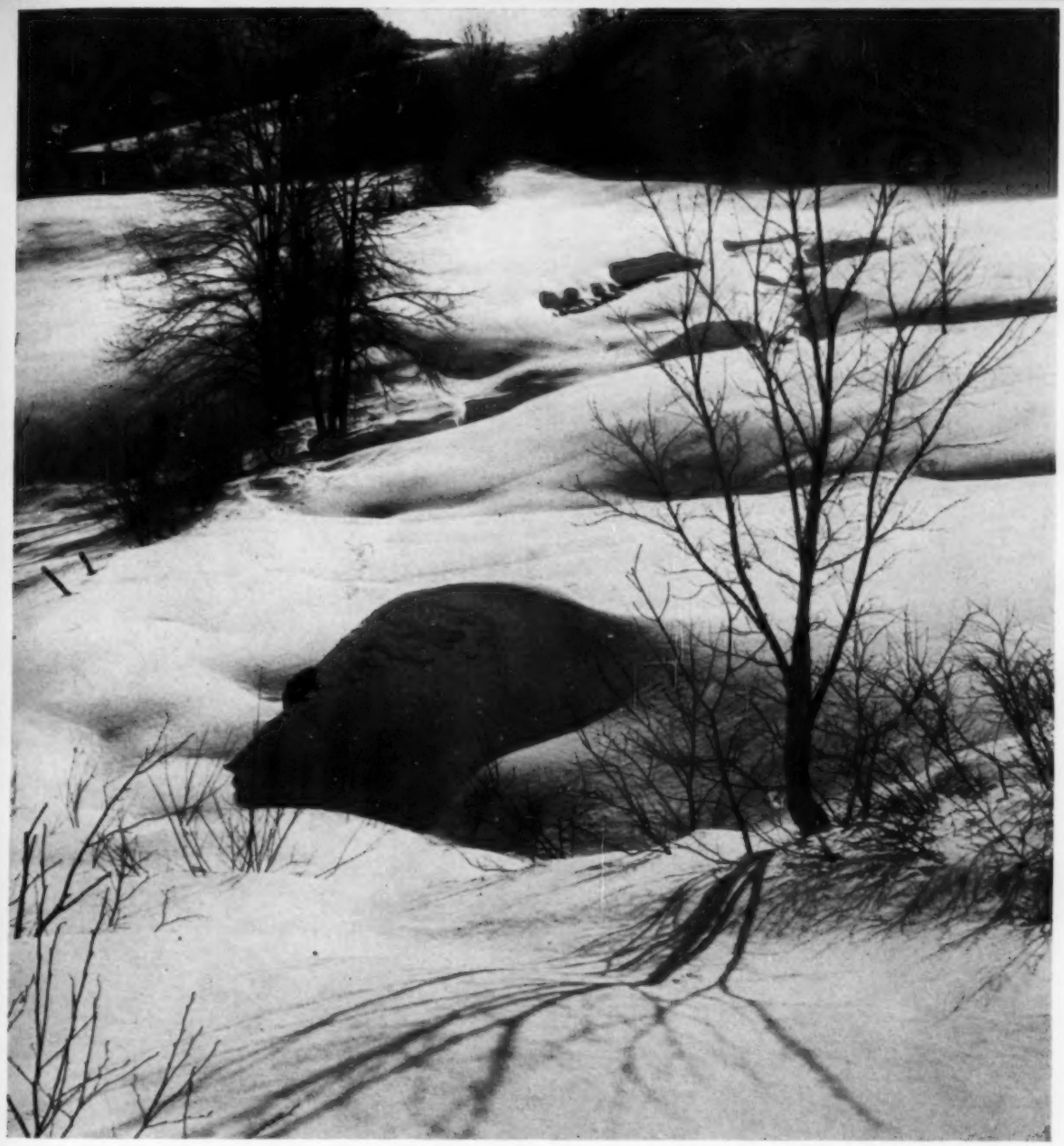
Conclusion

The preceding sections of this article provide a general outline of the history and current undertakings of the Research Division of the Ontario Department of Lands and Forests. Possibly, in conclusion, a brief statement should be added concerning basic underlying policy—the policy which originates, directs and shapes all departmental activities.

Obviously many separate and varied fields of operation are subject to the research program of an organization with the broad contacts of the Department of Lands and Forests, responsible, as it is, for the public administration of the renewable resources of fish, fur and forest. Nevertheless, throughout its diversity of functions there is an uncompromising unity of purpose, which is "to protect and improve what we have; to see that our resources are wisely and fully used; to replace what we have lost". And it is the responsibility of the Research Division to provide such research information as may be required to sustain and implement this policy.

C.P.R.

SOME WINTER SCENES IN CANADA



C.N.R.

WINTER IN THE HILLS

Arthur S. Bourinot

The hills lie sleeping in the winter snow
Hunching their sun-scarred backs beneath the white,
In unconcernèd slumber till their slow,
Lethargic stirring in the April light.

The river runs in interrupted rills,
Forced from the earth's great heart in sluggish beat,
An artery of the hibernating hills
And quietude unutterably complete.

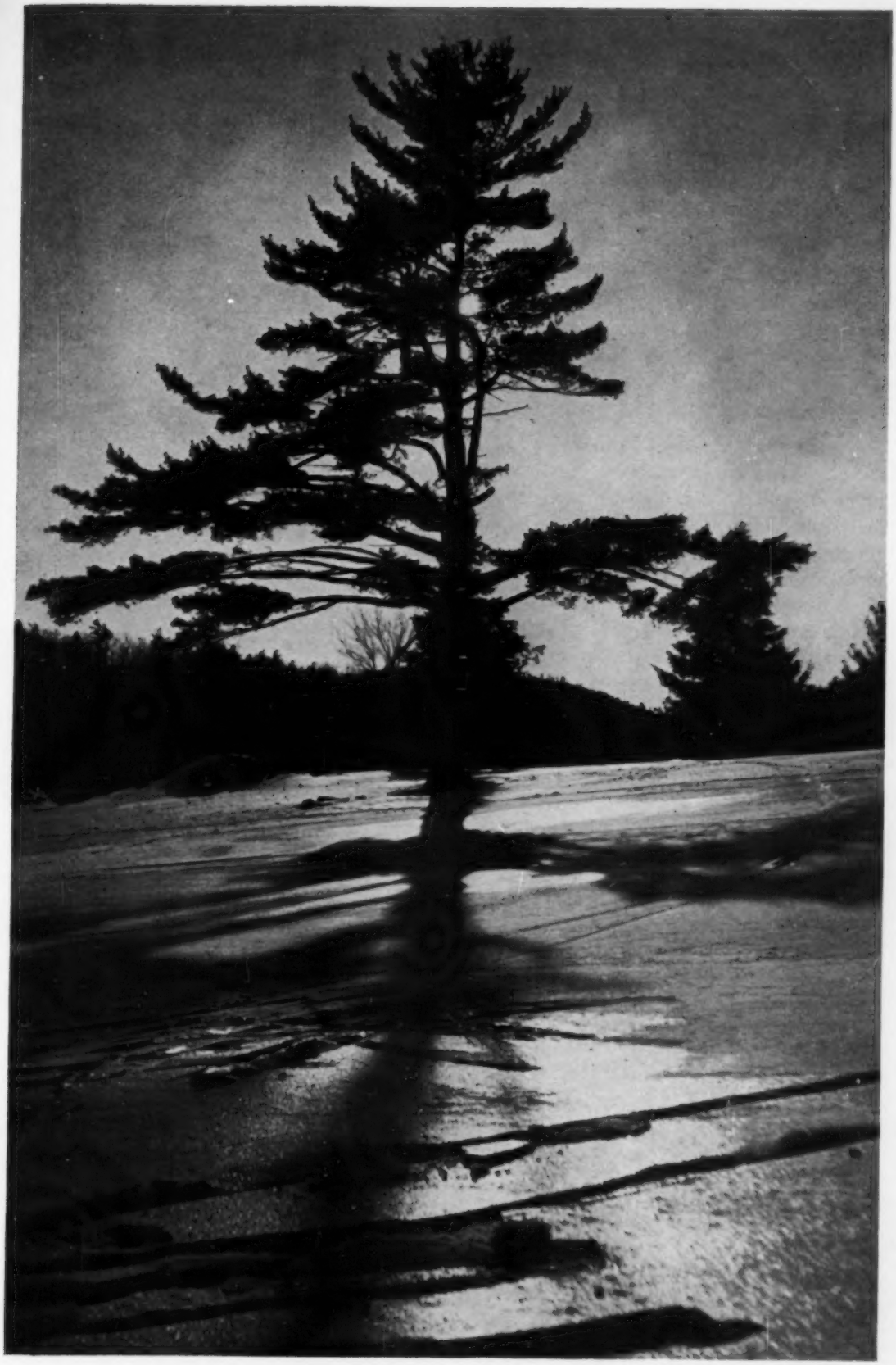
—From Collected Poems of Arthur S. Bourinot, The Ryerson Press
By permission of the author

C.P.R.

from THE SKIER'S LAMENT

Verna M. Ross

Here in the city's din and fevered stress
My smothered soul cries longingly for peace—
The peace of solitude, of pine-clad hills
Where mind and senses find a sure release
From too much striving; where the wintry breeze
Blows keen; where sunshine sparkles on the snow;
Where every twig and weed is diamond-dressed;
And far white mists blot out the world below.



Paul Horsdal

EDITOR'S NOTE-BOOK

A. P. Leslie, a graduate in Forestry of The University of Toronto, is Director of the Ontario Department of Lands and Forests' Southern Research Station at Maple.

* * *

Richard Harrington, so well known for his photographic record of the Canadian scene, particularly his arctic studies, has now taken his camera to the tropics and sends us an article about the Netherlands West Indies.

* * *

George Spence, C.B.E., came to Canada from Scotland as a young man. Entering the political field he has had a distinguished career in provincial and federal politics. After holding three different portfolios in Saskatchewan cabinets he resigned to become director of the Prairie Farm Rehabilitation Act of the Canadian Department of Agriculture. Mr. Spence relinquished directorship of the P.F.R.A. on his appointment as commissioner on the Canadian section of the International Joint Commission.

* * *

ERRATUM

In our issue for December 1951, credit for making the plexiglass top for the car used during the Royal Visit was wrongly attributed.

The following, by Alyce Coutts (with apologies to A. A. Milne), should set the matter right.

The Duke asked
the Aide, and
the Aide asked
de Havilland:
"Could we have a canopy
To guard the Royal head ?"
The Aide asked
de Havilland,
de Havilland
Said, "Certainly,
I'll go and tell
The men,
Then,
Before they go to bed."

The Duke nudged
The Princess,
And pointed to
The canopy;
The Duke said,
"Better, eh ?"
And nodded his head.

"Nobody," he said,
Smiling at her
Tenderly,
"Nobody," he said,
As he looked through
The canopy,
"Nobody,
My darling
Could call me
A fussy man
BUT
I did want a canopy to
guard the Royal head!"

* * *

AMONGST THE NEW BOOKS

Geography Can Be Fun

by Munro Leaf

(Longmans, Green & Co., Toronto, $2.75)

This is not a book to send the reader off into gales of laughter as its title might lead one to expect, but it is humorously written with appeal for young and old alike.

Through the medium of a small character called "George", the author leads his readers through some of the main complexities of the subject of Geography. The earth in space, day and night, heat and cold, and the seasons are all explained as simply as if the sciences of mathematics and physics did not exist. The illustrations are not circles, spheres, ellipses and angles, but chucklesome charcoal drawings which George, himself, might have drawn and captioned. But Munro Leaf's fun is not without a plan. Beginning with Gettysburg—"the place where George lives", he deals with the various physical elements of Geography. After this "George was ready to find out what the different parts of the world were like and how and why people live there or do not live there. AND THAT IS WHAT GEOGRAPHY REALLY IS." Again George learns about his home state before the rest of the United States. Then he finds out about Canada. From Canada his thoughts turn to Political Geography, but he finds the evolution of the British Empire a little too much for him. It is perhaps understandable that the term "Commonwealth" would be less comprehensible than the term "British Commonwealth", especially as George had gone to the trouble of drawing a very regal crown in the middle of his copy-book and perhaps it was the crown that made him use "England" where he meant "Britain". Perhaps, too, one may stretch a point (for George) and say that the islands of the West Indies and Malaya are members of the Commonwealth, but even George would find it hard to convince India and Pakistan that they are not separate countries. Also, one would have hoped that the news that Burma was as republican in political status as the United States itself would have reached Gettysburg by 1951. However, George will undoubtedly learn these things in time. Unless he does, Geography will not be fun.

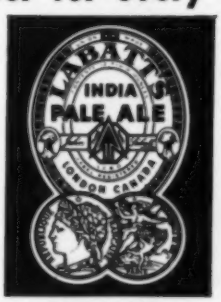
N. L. NICHOLSON.

HAPPY ANNIVERSARY

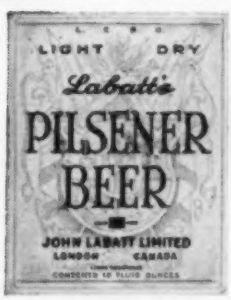
. . . *Tommy Tweed!* A leading light in Canadian radio for almost two decades, Tommy Tweed has played many parts with an unusual variety of voices. With one voice, Canadian listeners will join in congratulating him on his 18th Anniversary in radio! When you're celebrating an anniversary, remember Labatt's Anniversary Ale—the ale that's specially brewed for glad occasions. You'll enjoy Anniversary Ale more, enjoy it longer, because of its *special* lightness and smoothness. There's nothing better for your full enjoyment than the lightest, smoothest ale of all—Labatt's Anniversary. Next time make sure it's a better time—order a case or two of Anniversary Ale.

A beer for every taste

smoother, lighter flavour



a man's drink



light dry sparkle

JOHN LABATT LIMITED

The Book of Canadian Achievement

by Helen Palk

(Dent, Toronto, $3.75)

This book, by the late Helen Palk, relates some of the achievements of Canadians in agriculture, science, industry, the Arts, sport, aviation, and radio. Most of the sections are well written and quite definitely do awaken enthusiasm and emotion. They will probably inspire many youngsters and help them to realize that what one man has done in the past another may do in the future.

It has always seemed to me that those who write books for the use of school children should be even more careful than others to avoid errors, for the child is less able to detect a mistake than are his elders. In this particular book, unfortunately, errors abound. Some are merely typographical slips such as parslane for purslane, pear for pea, pervious for previous, and eight-three for, I assume, eighty-three. Others are bad grammar, several instances of which were encountered. Still others are the more serious type of mistake in which a false statement is presented as a truth, or a misleading mental picture is formed in the mind of the reader.

Here we have Sir Charles G. D. Roberts hailed once more as the originator of the "animal story", which he was not; Pauline Johnson is referred to as an "Indian Princess"; the description of her "traditionally Indian" costume is ludicrous; the hobo practice of "riding the rods" long antedates the 1930's; we doubt the actual presence of "poisonous insects" in the drinking water of Paul Kane, who was hardly the "first artist to put on canvas the picturesque aborigines of the Canadian West"; there is the common misapprehension about the Flathead Indians, and further confusion about totem poles; and, finally, there are no Eskimo school children in the Yukon.

Even so, this book is worth putting in the school library and many a child will enjoy it, will be filled with pride, and stirred to emulation.

DOUGLAS LEECHMAN

K33

EXTRA OLD STOCK ALE

North Pole Boarding House

as told by Elsie Gillis to Eugenie Myles

(Ryerson, Toronto, $3.95)

This account of the year that Mrs. Gillis spent at Arctic Bay, up at the north end of Baffin Island, has much to commend it. There is none of the fabrication and the half-truth and none of the fake romance which has marred so many books about the Arctic. The little events of her daily life, as well as the larger ones, are narrated simply and effectively and one is able to share in all of them. Even the most trivial details become interesting and her way of telling them is intimate and convincing.

Included in the book is one of the best sketches of Canon Jack Turner ever written and we have the privilege too of meeting Joan Turner, his wife, and getting to know her better. Jack Turner was one of the best liked and most respected missionaries ever to visit the eastern Arctic and his tragic death was regretted by all who knew him. Jimmy Bell comes alive too and one can but regret that there is no picture of him.

There are some things left out, of course, such as the Northern Lights which surely can not have escaped her notice. Perhaps more space might have been devoted to the Eskimos, but the permanent native population at Arctic Bay is small and they had comparatively little direct contact with the strange white people at the "met" station whose chief virtue was that their discarded packing cases made most desirable coffins.

Mrs. Gillis must be one of those who fit in well down North, and apparently she made but few of the mistakes that most people who go there are guilty of. Not that she escaped scot-free, of course; nobody does. Perhaps one of her more serious mistakes was in not writing her own book herself. With a degree from the University of Alberta she is surely capable of doing so, and then we might have been spared some of the irritating slips in grammar that got past editors and proof readers.

The absence of a map is deplorable and the average reader may well have a hard time finding Arctic Bay. Why the Epilogue, which gives a brief account of the loss of the *Nascopie*, is titled "Prologue" will ever remain a mystery.

DOUGLAS LEECHMAN